PB82-190232

Draft Environmental Impact Statement
City of Los Angeles Wastewater Facilities Plan
Chapters VII, VIII, IX, X, XI, and XII

Los Angeles City Dept. of Public Works, CA

Prepared for

Environmental Protection Agency
San Francisco, CA

Sep 77

U.S. Department of Commerce
National Technical Information Service
NTIS

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16. Abstract (Limit: 200 words)
This EIS presents information to the public to assist in the decisionmaking process; it highlights the environmentally sensitive areas in the City of Los Angeles and its metropolitan region; it defines the role that wastewater treatment alternatives play in changing the existing environment of these areas; it evaluates the potential for water reclamation and conservation; evaluates and recommends a list of feasible alternatives ranked according to their environmental impacts, either positive or negative, and suggests mitigative measures that will allow maintenance of water quality and expansion to meet future needs without adversely affecting the social, biological, and physical environment of Los Angeles. The major environmental issues identified are: Total Sewage System Capacity - What additional sewage capacity should be provided for and what are the primary and secondary effects of providing this capacity? Location - Where should the additional capacity be located for cost effective wastewater treatment with minimal environmental impacts? Ocean Discharge - What changes will result in the nature of wastewater constituents entering the Pacific Ocean and what will be the effects of these changes? Reclamation - What are the values, feasibility, and environmental impacts of measures designed to conserve and utilize wastewater and its components through reclamation?

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Sludge Treatment
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Water Reuse

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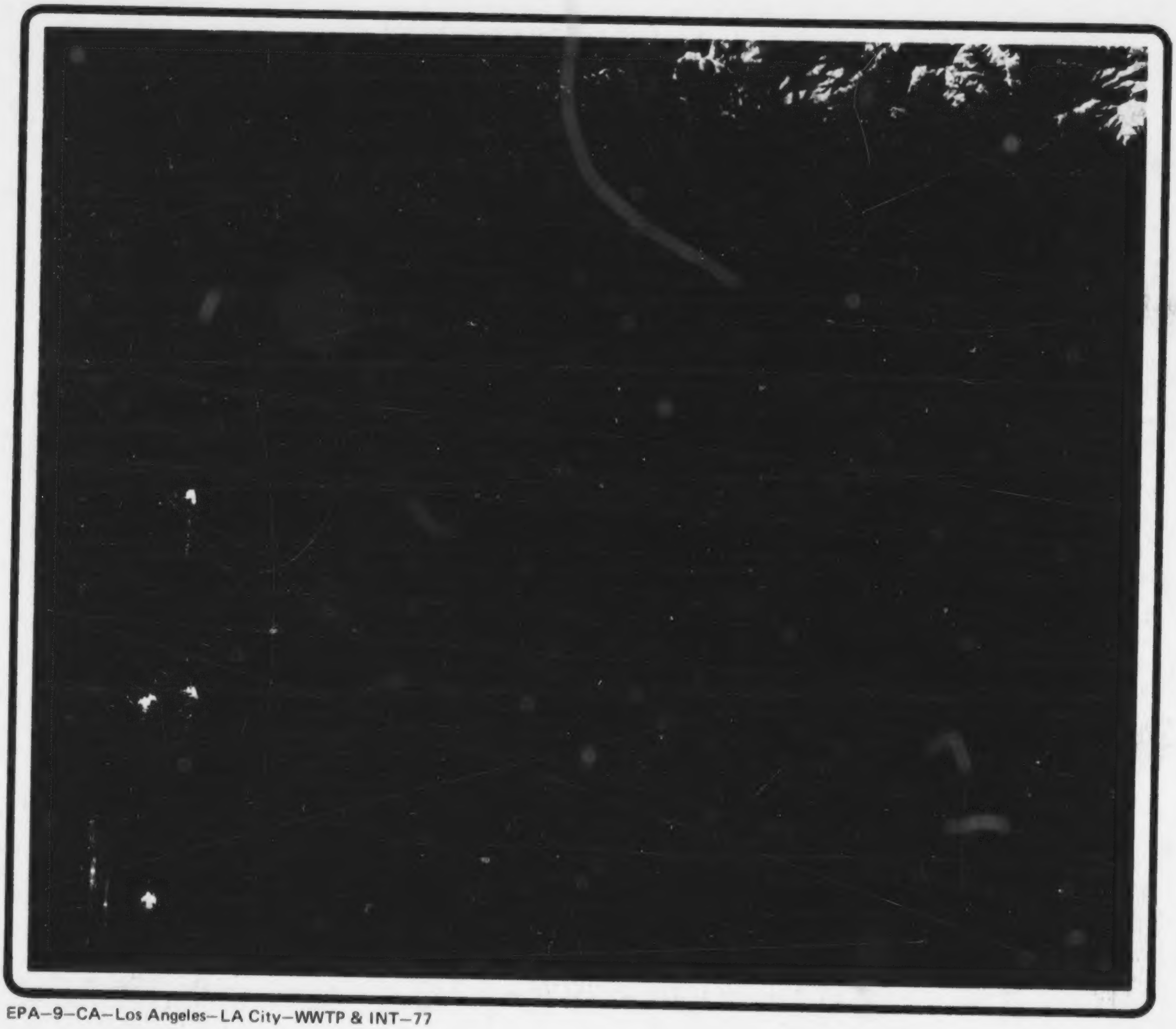

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Chapters VII, VIII, IX, X, XI, and XII

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VII-i-a

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REGION IX
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SEP 01 1977

To All Interested Agencies, Public Groups, and Concerned Individuals:

We submit for your review and comment the Draft Environmental Impact Statement/Environmental Impact Report for the City of Los Angeles Wastewater Treatment Facilities Plan. This statement has been prepared in compliance with the National Environmental Policy Act of 1969 (P.L. 91-190), and implementing regulations promulgated by the Council on Environmental Quality and the Environmental Protection Agency. It has also been prepared in compliance with the California Environmental Quality Act and its implementing regulations.

The EIS/EIR summary and full report present the environmental, economic and social effects of wastewater facility planning decisions which will affect over 3.4 million persons living in the City of Los Angeles and contract cities, and involve capital costs in excess of 300 million dollars over the next five years.

The main purpose of this document is to publicize the long range environmental and social effects of wastewater facility alternatives so that citizens and governmental agencies can comment and express their concerns and preferences. Public comments are expected to play a key role in (1) selection of long-range alternatives for the service area, including size and location of collection and treatment facilities, and (2) implementation of measures needed to reduce adverse environmental effects.

The Environmental Protection Agency, Region IX and the City of Los Angeles, Bureau of Engineering will hold hearings on the Draft EIS, approximately 30 days following the distribution of the EIS. The exact place and date will be announced. All interested parties are invited to express their views at the hearings. Persons wishing to make comments may submit them in writing and/or appear at the hearings. Oral statements will be considered, but, for the record, all important testimony should be submitted to:

Environmental Protection Agency, Region IX
Attn: Fred Krieger, W-1
100 California Street
San Francisco CA 94111

VII-i.b

Enough copies of the written material should be provided so that other interested parties at the hearing may receive a copy. Oral statements should summarize extensive written material since it is necessary for all interested parties to be heard. After the public hearings the Draft EIS/EIR will be revised in light of the comments to form the Final EIS/EIR.

If you do not comment at the public hearings, you may send written comments to EPA at the address given above within thirty days following the hearings.

The following documents constitute the EIS:

Mini-Summary
General Summary
Main text (3 volumes)
Addendum 1. Reclamation Options
Addendum 2. Environmental Analysis of Reclamation
Addendum 3. Interim Sludge Processing and Disposal System
Appendices

Copies of these documents can be obtained by written or by telephone requests at the address given above or at:

City of Los Angeles, Bureau of Engineering
City Hall East-Room 650
200 North Main Street
Los Angeles CA 90012 Attn: Fred Hoeptner
(213)485-3089

Additionally the Draft EIS and supplemental information may be reviewed at the above addresses or at the public libraries within the service area of the City of Los Angeles.

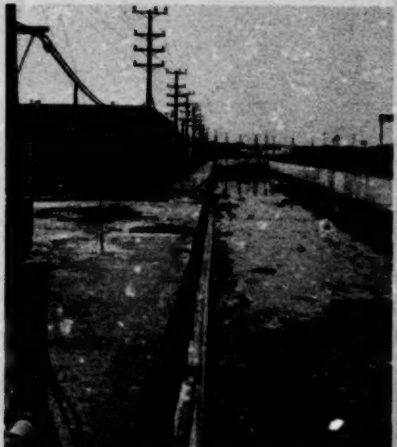
Please bring this notice to the attention of all persons who would be interested in this matter.

Sincerely,

Sheila M. Prindiville

for Paul De Falco, Jr.
Regional Administrator

Chapter VII



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A. introduction

A. INTRODUCTION

Chapter VI summarizes the existing wastewater collection and treatment facilities serving the City of Los Angeles and contract cities, and describes existing problems and foreseeable deficiencies in the facilities.

Chapter VII reviews the possible projects that have been considered to meet the City's needs for wastewater systems improvements to the year 2000. Initial screening of projects is summarized, and the five projects selected for final evaluation are presented in greater detail.

Most alternatives presented in this EIS are described in greater detail in the Facilities Plan (DPW, 1975a). A few additional alternatives are considered in this EIS to meet federal and state requirements for assessment of "No Project" impacts. The capacities used in planning of alternatives described in the Facilities Plan are based on the SCAG-76 projections which used the 1974 DOF D-100 series statistics (see Chapter IV for a description of population projections and related funding restrictions).

Because of the environmental orientation of this description of alternatives, options based on the SCAG-76 population projections and capacities including "5-day, 5-week" dry-weather flows have been used throughout. The original flow projections provided in the 10 June 1976 draft of the Facilities Plan have been used; these flow projections are currently being modified, but the essential elements of the Plan are not expected to change.

Because the SCAG-76 population figures are greater than DOF E-O projections for the service area, use of the SCAG-76 estimates would result in higher generation rates for wastewater, with consequent increased amounts of required construction and related impacts.

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B. alternative receiving initial consideration

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B. ALTERNATIVES RECEIVING INITIAL CONSIDERATION

The basic wastewater system deficiencies described in Chapter VI are shown in Figure VII-1. Alternatives presented in the Facilities Plan are designed to eliminate these specific deficiencies and meet the following criteria:

- Discontinuation of sludge disposal to the ocean.
- Provision of full secondary treatment of effluents discharged to receiving waters.
- Provision of capacity adequate to serve the SCAG-76 population projected for the year 2000.
- Elimination of sewage overflows.

The Facilities Plan discusses the separate alternatives in categories identified by letter symbols (A, B, etc.) for simplicity in reference. The nomenclature has been retained in the discussion of alternatives for the convenience of those readers who wish to refer to the more detailed discussions in the Facilities Plan. In addition, two alternatives ("X Alternatives") not described in the Facilities Plan have been addressed.

The nineteen alternatives, including three "No Project" possibilities, which received initial consideration are listed in Table VII-1. In brief, the following generalizations characterize the alternatives in each series:

- A Series. "No Project" alternative, with subalternatives providing hydraulic relief to the San Fernando Valley.
- B Series. Coastal/inland alternatives, with treatment capacities varied among Hyperion and two potential inland sites.
- C Series. Coastal-only alternative, with subalternatives providing hydraulic relief to the San Fernando Valley.
- D Series. Zero discharge alternatives—no discharge to receiving waters.
- E Series. Maximum reclamation alternative.
- F Series. Combination of Los Angeles City System with that of County Sanitation Districts.
- G Series. Treatment of storm runoff (not a wastewater-related alternative, not in scope of present plan).
- H Series. Improved management, operational, and maintenance procedures.

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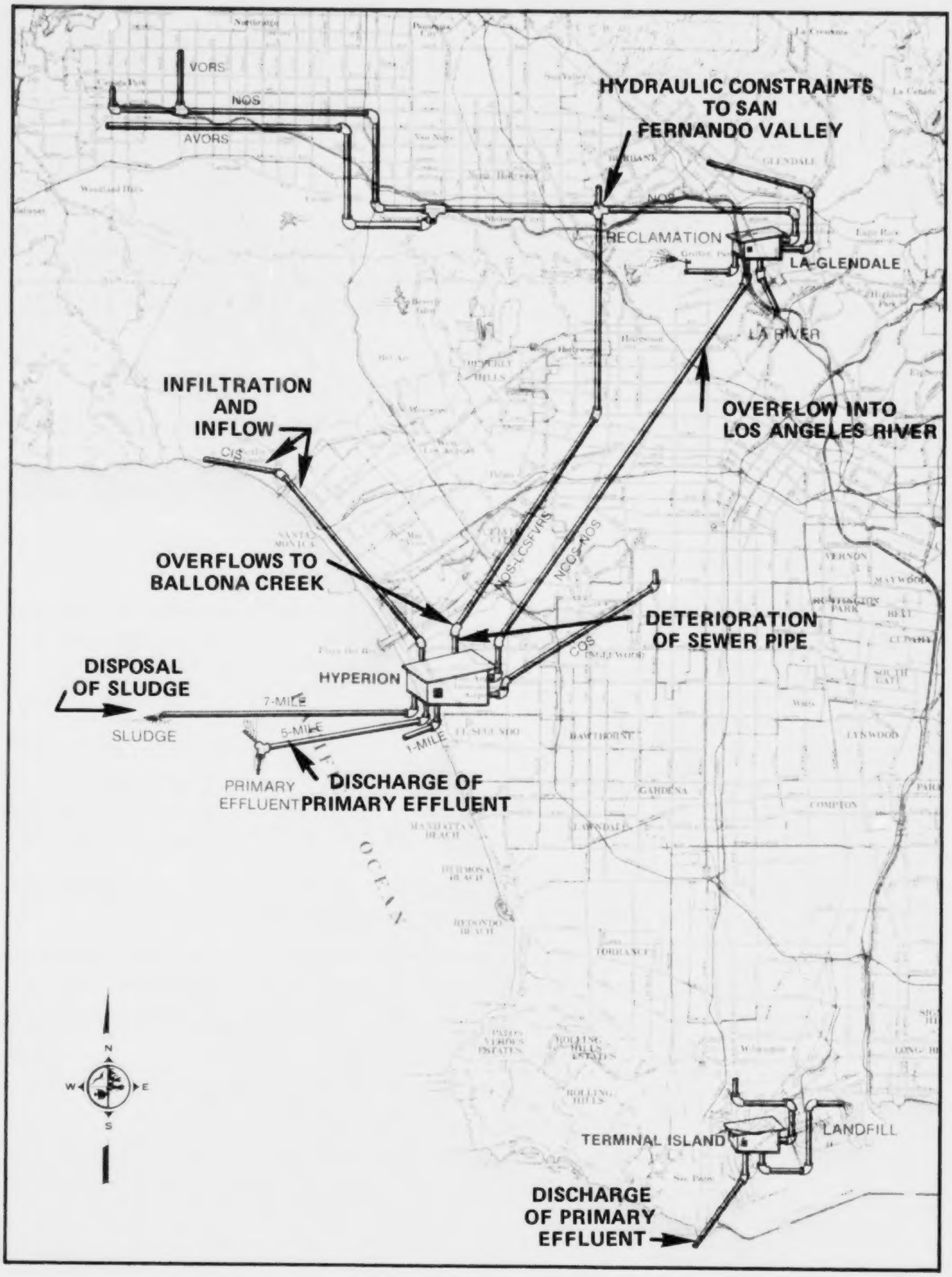
VORS
NOS
AVORS
HYDRAULIC CONSTRAINTS TO SAN FERNANDO VALLEY
NOS
RECLAMATION
LA-GLENDALE
LA RIVER
OVERFLOW INTO LOS ANGELES RIVER
INFILTRATION AND INFLOW
CIS
OVERFLOWS TO BALLONA CREEK
NOS-LCSFVRS
NCOS-NOS
DETERIORATION OF SEWER PIPE
COS
DISPOSAL OF SLUDGE
HYPERION
7-MILE
SLUDGE
5-MILE
1-MILE
PRIMARY EFFLUENT
DISCHARGE OF PRIMARY EFFLUENT
OCEAN
N
W
E
S
TERMINAL ISLAND
LANDFILL
DISCHARGE OF PRIMARY EFFLUENT

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Figure VII-1. Deficiencies in the present Los Angeles wastewater collection and treatment system.

Table VII-1. Alternative projects receiving initial consideration.

	PHYSICAL PLANT CHANGES								DESIGN CRITERIA			
EVALUATION CRITERIA ALTERNATIVE	HYPERION MODERNIZATION	HYPERION EXPANSION	LA-GLENDALE EXPANSION	SEPULVEDA CONSTRUCTION	SEPULVEDA EXPANSION	EVIS	AVORS TUNNEL	LA CIENEGA	STOPS OCEAN SLUDGE DISPOSAL	PROVIDES FULL SECONDARY TREATMENT	PROVIDES FOR SCAG-76 POPULATION PROJECTIONS	PROVIDES HYDRAULIC RELIEF
• A-1 No-Project	Yes	No	No	No	-	No	No	No	No	No	No	No
• A-2a with inland treatment and EVIS at Sepulveda	No	No	No	Yes	Yes	Yes	No	No	No	No	Yes	Yes
• A-2b with additional relief sewer (AVORS)	No	No	No	No	-	No	Yes	No	No	No	Yes	No
• B-1 inland treatment at Sepulveda with EVIS and Hyperion	Yes	Yes	No	Yes	No	Yes	No	No	Yes	Yes	Yes	Yes
• B-2 Modular inland expansion at Sepulveda and LA-Glendale without Hyperion modernization	No	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes
• B-3 Modular inland expansion at Sepulveda with Hyperion modernization	Yes	No	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes
• B-4 Modular inland expansion at Sepulveda and LA-Glendale with Hyperion modernization	Yes	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes
• B-5 Small reclamation plants	Yes	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes
• C-1 retention Basins	Yes	Yes	No	No	No	Opt.	No	No	Yes	Yes	Yes	Yes
• C-2 Pumped Flows	Yes	Yes	No	No	No	Opt.	Opt.	No	Yes	Yes	Yes	Yes
• C-3 Construction of interceptor sewers	Yes	Yes	No	No	No	Opt.	Yes	No	Yes	Yes	Yes	Yes
• D Effluent evaporation	Yes	Yes	Opt.	Opt.	Opt.	Opt.	Opt.	No	Yes	Yes	Yes	Some
• E Maximum Reclamation	Yes	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
• F-1 Combined treatment systems with Los Angeles County SAND (interconnection of interceptors)	Yes	Yes	Yes	Yes	Opt.	Opt.	No	No	Yes	Yes	Yes	Yes
• F-2 Combined treatment system with Las Virgenes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes
• G Treatment of storm runoff	Storage and treatment of storm runoff is not comparable with above projects and would require basinwide systems.											
• H Improved management	To be incorporated into the above alternatives.											
• EX Modular expansion of LA-Glendale with Hyperion	Yes	Yes	Yes	No	-	No	Yes	Yes	Yes	Yes	Yes	Yes
• CX Hyperion expansion to capacity required for year 2000 flows. No hydraulic relief to San Fernando Valley	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	No	No

- X Series. Additional alternatives, not addressed directly in the Facilities Plan, that would meet legislative mandates but not provide significant hydraulic relief to San Fernando Valley.

Excluding Alternative G which is a regional solution and Alternative H which will be incorporated into any other alternative, the remaining seventeen projects fall into four basic categories:

- No Project alternative which fails to meet state and federal requirements for sludge disposal and secondary treatment (A1 only).
- Inland/Coastal treatment projects which include Sepulveda and EVIS I and II and may include expansion of LA-Glendale, and coastal treatment through moderization at Hyperion (A2a, A2b, B1, B2, B3, B4, B5, F1, and F2).
- Coastal treatment projects which include hydraulic relief to the San Fernando Valley through the AVORS tunnel or some alternative means but exclude Sepulveda (C1, C2, C3, and D).
- Treatment projects which do not include hydraulic relief to the San Fernando Valley but do meet ocean discharge requirements (CX, used for secondary impact analysis only).
- Full reclamation projects which include the La Cienega Plant and maximum reclamation of water when combined with one of the other alternatives (E2 and EX).

System improvements common to all alternatives except for the A series, including the No Project alternative, are identified in Figure VII-2. Some existing problems such as minimization of infiltration and inflow to the Coastal Interceptor Sewer, and repair of exfiltration to the L.A. River are discussed briefly in the Facilities Plan as "additional projects of significance" which are recommended in the 1977-82 Five-Year Capital Improvement Program. These projects, independent of the major alternatives, receive detailed examination in the Facilities Plan, and could be implemented with or without other project elements. A comparison of Figure VII-1 shows that all major problems except for hydraulic relief are resolved by each of the construction alternatives.

1. NO PROJECT

The basic No Project alternative (A1) includes only continued operation of existing facilities and completion of all presently committed or approved projects. Unsewered areas would remain unsewered, discharges from the Hyperion Treatment Plant would not receive full secondary treatment, and sludge discharges to the ocean would continue.

In reviewing the 1975 draft EIR on proposed HTP improvements (DPW, 1975) the State Water Resources Control Board (SWRCB) defined projects that could proceed without Facilities Plan Approval. These are included

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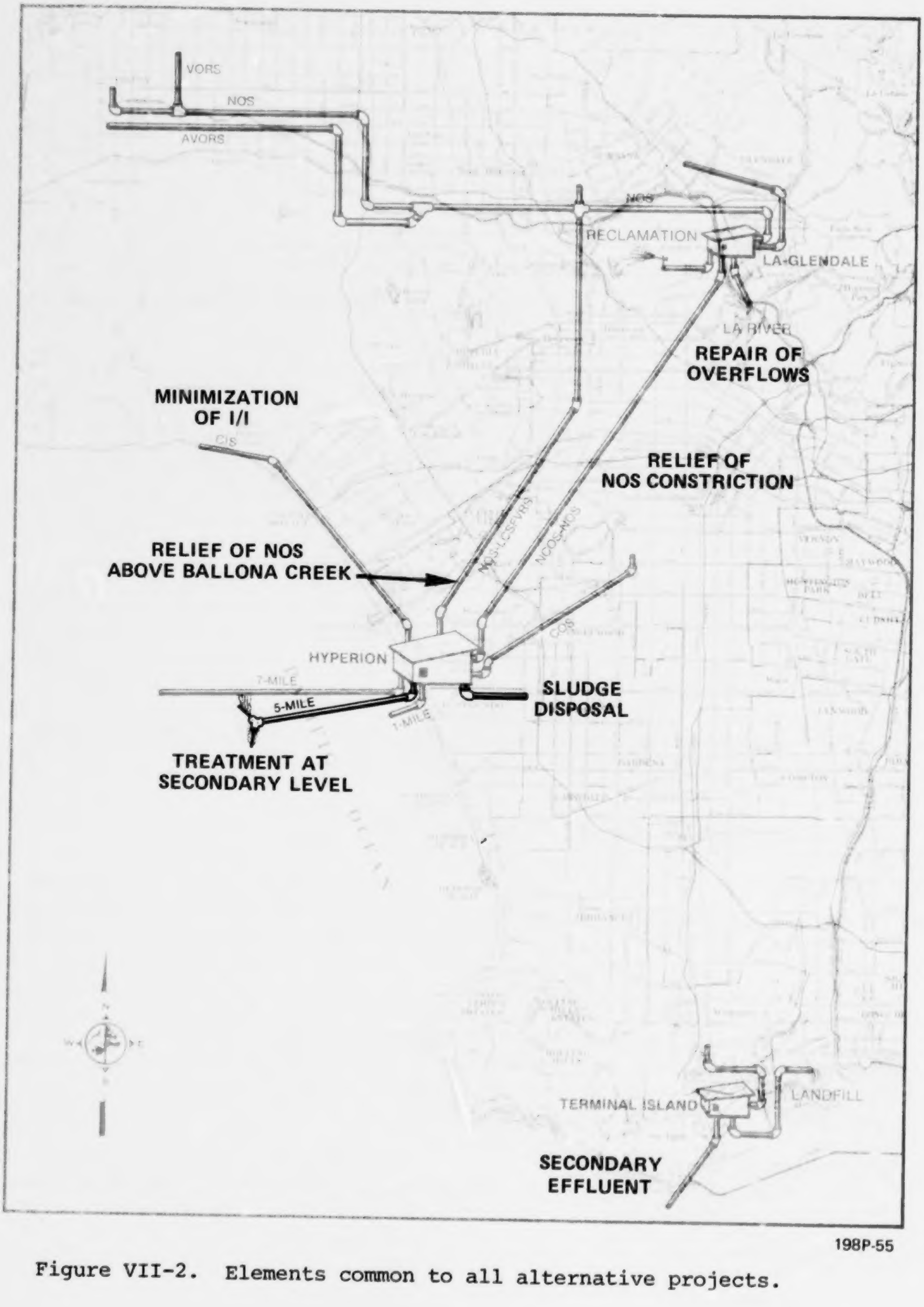

VORS
NOS
AVORS
NOS
RECLAMATION
LA-GLENDALE
LA RIVER
REPAIR OF OVERFLOWS
MINIMIZATION OF I/I
CIS
RELIEF OF NOS CONSTRICTION
RELIEF OF NOS ABOVE BALLONA CREEK
NOS-LCSFVRS
NCOS-NOS
COS
HYPERION
7-MILE
5-MILE
1-MILE
SLUDGE DISPOSAL
TREATMENT AT SECONDARY LEVEL
TERMINAL ISLAND
LANDFILL
SECONDARY EFFLUENT
198P-55

Figure VII-2. Elements common to all alternative projects.

in No Project alternative, and the decision as quoted in the Final EIR (DPW, 1976) is shown below:

> " . . . there are several Hyperion projects which are not EIS constrained and that could be scheduled for construction prior to completion of the Areawide Facilities Plan and EIS and still conform to State and Federal regulations." [Refer to 40 CFR 35.917(d).]
>
> 1. Hyperion Primary Modernization
> 2. Hyperion Digester Modernization only
> 3. Hyperion Secondary Phase I (less than 200 MGD of secondary treatment)
> 4. Hyperion Effluent Eductor
> 5. Miscellaneous construction such as a new administration building, conversion of the existing administration building to a laboratory site excavation, etc."

These projects are the same as proposed Phase I work and part of Phase II work for conversion of HTP to 307 mgd secondary treatment capacity. Details are given in Section VII.D-2.

Despite improvements at HTP, the No Project alternative would violate the requirements of PL 92-500 and the Ocean Plan and would potentially violate the requirements of the Bays and Estuaries Policy. Discharges of chlorinated raw sewage into Ballona Creek also would continue. Development in parts of the San Fernando Valley would have to be curtailed, or measures taken to prevent ultimate overloading of the interceptor sewers serving that area to prevent potential future overflows of raw sewage into the city streets or the Los Angeles River.

2. INLAND/COASTAL TREATMENT ALTERNATIVES

Projects termed "No Project" in the Facilities Plan that resolve potential hydraulic problems in the San Fernando Valley include Alternatives A2a and A2b. Alternative A2a is the extension of the existing Additional Valley Relief Sewer (AVORS) southward (a tunnel through the Santa Monica Mountains would be required), to a termination point into the North Central Outfall Sewer (NCOS) at Culver City. This additional sewer would require a minimum dry weather capacity of 44 mgd to be adequate through the year 2000, and an early construction date. Current capacity at HTP would not be exceeded, but the violations of PL 92-500 and the Ocean Plan would continue.

Similarly, an inland treatment plant (Alternative A2b) could be constructed to provide hydraulic relief in the Valley and some additional "better than secondary" treatment capacity. The site selected by the city as most appropriate is in the Sepulveda Flood Control Basin which is traversed by the existing AVORS interceptor. Designs are available for this facility, so that it could be constructed and in operation in a relatively short time frame at 40 mgd capacity. An additional 5 mgd capacity would, however, be necessary by 1978. Although 40 mgd of secondary capacity would be added to the system, violations of PL 92-500 and the Ocean Plan would continue.

The B series alternatives provide differing amounts of coastal (Hyperion) and inland (San Fernando Valley or Glendale) treatment capacity, and have several common elements:

- All sludge is processed at Hyperion for economic reasons, but sludge disposal to the ocean is completely discontinued.
- All wastewater receives secondary or better treatment, and discharges to receiving waters are in substantial conformance with the Basin Plan, Bays and Estuaries Policy, or Ocean Plan, as appropriate.[1]
- The overflow condition at Ballona Creek will be largely relieved as a result of reductions in flow through the NOS-LCSFVRS system.
- Service will ultimately be provided to presently developed but unsewered areas in the Hyperion service area, and to the Crescenta Valley County Water District.

The effects of current discharges of effluent and sludge into the ocean from Hyperion, and the impact of ceasing sludge discharge and converting to full secondary treatment, have been major considerations in the studies and analyses conducted for this EIS (see Chapter VIII). Similarly, the impact on air quality of growth in the San Fernando Valley that may be facilitated, although not necessarily caused by provision of sewage service, has been treated in depth (see Chapter IX).

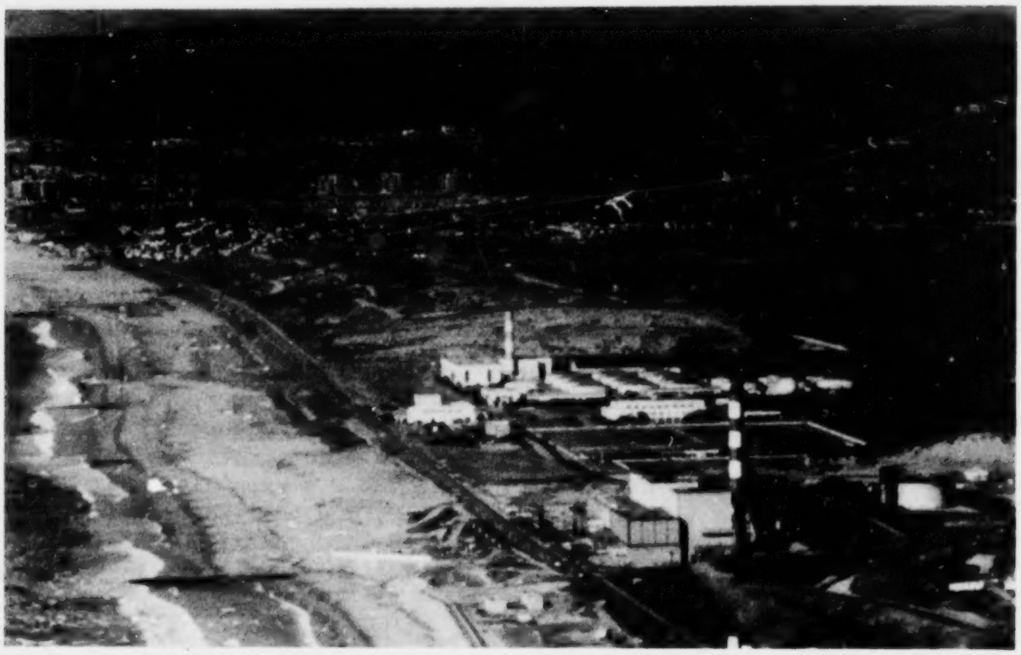
Expansion at Hyperion is subject to restrictions because the site is almost fully developed except in areas with steep slopes, and little adjacent land is available for expansion. Studies conducted by the City indicate that the maximum economic size for a plant providing full secondary treatment at this site is 307 mgd. The B series alternatives (except B1) recognize this limitation at HTP, and call for remaining capacity needs to be provided at inland sites. The maximum possible size at Hyperion is approximately 432 mgd for full secondary treatment.

---

[1] Discharge requirements for chromium may not be met, even with best source control and best practicable treatment technology.

198P-349

This land owned by the City Department of Water and Power is immediately east and approximately 20 feet higher than Hyperion. It serves as a buffer between the Hyperion Treatment Plant and the residential areas to the east.



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The lawns west of Hyperion under which the ocean discharge pipes run and the steeper terrain to the east with Department of Water and Power Transmission lines are visible in this photograph. Expansion to the north, into Airport property, could detrimentally affect the habitat of a rare and endangered butterfly species, the El Segundo Blue. View is north along the Vista del Mar Boulevard.

With an effective treatment capacity of 19.0 mgd at LA-GWRP (20 mgd capacity, 1.0 mgd sludge return to Hyperion), a 400 mgd capacity at HTP would thus be adequate to service its tributary area, assuming a total flow of about 425 mgd in the year 2000. Construction in this scale would be costly, not only for the plant itself, but for the additional interceptors required to transport wastewater from the San Fernando Valley. Alternatives including these features are C series alternatives.

A different set of restrictions applies to the plants to be located in the San Fernando Valley. The total amount of wastewater generated places an obvious upper limit on the amount that can be treated. In addition, however, a sufficient amount should remain untreated to maintain adequate flow in the interceptors feeding Hyperion to ensure that sludge generated by the Valley treatment plants is transported effectively. This condition stems from the economic decision to centralize sludge processing at HTP.

Economic studies conducted by the City of the possible economic trade-offs indicate that cost effectiveness would be obtained if a total 425 mgd flow were treated with approximately 300 mgd of coastal, and 125 mgd of inland capacity. This general guideline was thus used in development of the B series alternatives.

Two specific locations have been selected by the City for Valley treatment plants: one at the existing Los Angeles-Glendale Water Reclamation Plant, the other at a site in the Sepulveda Flood Control Basin. The City has emphasized construction of the Sepulveda Facility and the East Valley Interceptor Sewer (EVIS I and EVIS II) to provide hydraulic relief for the NOS-LCSFVRS system.

Table VII-2 summarizes the locations, capacities, and phasing of the options considered in apportioning treatment between Hyperion and the San Fernando Valley plants. Three capacities have been considered at Hyperion: 270 mgd, which can be achieved economically without three specific improvements[1]; 307 mgd, which can be achieved with these improvements; and 359 mgd, which requires expansion beyond what is thought to be the economical maximum. A range of corresponding inland plants, with differing locations, capacities and installation dates, has been examined as shown on the table.

Except for Alternative B1, which proposes only 40 mgd capacity at Sepulveda and uneconomical construction of additional interceptor capacity with probably infeasible tunneling and pipelaying (3.5 mgd), the environmental differences among these B series options are subtle. All involve construction of the Sepulveda Facility at 40 mgd in 1977, with discharge of treated water not used for park and golf course irrigation into the Los Angeles River. Under present regulations of the State Department of Health, this practice will foreclose the spreading and subsequent reuse of storm waters or other runoff into the Headworks spreading grounds, a groundwater recharge area downstream of the discharge point of the plant. Construction of Sepulveda will provide hydraulic relief through construction of the East Valley Interceptor Sewer (EVIS), designed to intercept wastewater that would otherwise be tributary to the NOS-LCSFVRS system. Such construction is accompanied by all the impacts of pipelaying (see Chapter VIII).

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[1] Addition of a booster pump on the outfall, installation of additional primary sedimentation tanks, and modernization of the existing primary systems.

Alternative B2, based on construction of Hyperion at the minimum size considered (270 mgd), results in the greatest rate of increased flow in the Los Angeles River, and the greatest sustained flow, assuming that reclamation uses are equally developable for all options. Alternative B4C, based on a 307 mgd HTP, increases the production of tertiary-treated water at the most uniform rate, as the result of the timing of modular additions to the plants. It is therefore more likely to result in a more uniform long-term dry-weather flow rate in the river, as consumptive uses are developed to offset increased supply.

Similarly, early large additions to the Sepulveda Facility in excess of gravity fed capacity would incur energy penalties through required pumping.

Table VII-2. Major project elements of B Series alternatives.

ALTERNATIVES	HTP MODERNIZATION	HTP	INITIAL SWRP	SWRP EXPANSION	LAGWRP EXPANSION	DIVERSION TO NCOS-NOS	KEY ELEMENTS
B1	Yes	359 mgd	40 mgd	None	None	10 mgd	Hold SWRP at 40 mgd and expand HTP.
B2	No	270 mgd	40 mgd	75 mgd	20 mgd	20 mgd	Hold HTP to effective secondary capacity with primary modernization.
B3	Yes	307 mgd	40 mgd	55 mgd	None	None	All future inland treatment at SWRP.
B4	Yes	307 mgd	40 mgd	45 mgd	10 mgd	10 mgd	Modular expansion to SWRP and LAGWRP
B5	Yes	307 mgd	40 mgd	-	-	-	Construction of small reclamation plants as treatment reuse would dictate.

Figure VII-3 schematically depicts Alternative B4 that includes modernization of Hyperion and construction of inland treatment facilities at Sepulveda with the Sepulveda plant receiving sewage from the East Valley Interceptor Sewer (EVIS). At present, insufficient demand combined with California State Department of Health policies regarding groundwater recharge of reclaimed water preclude the economic use of significant

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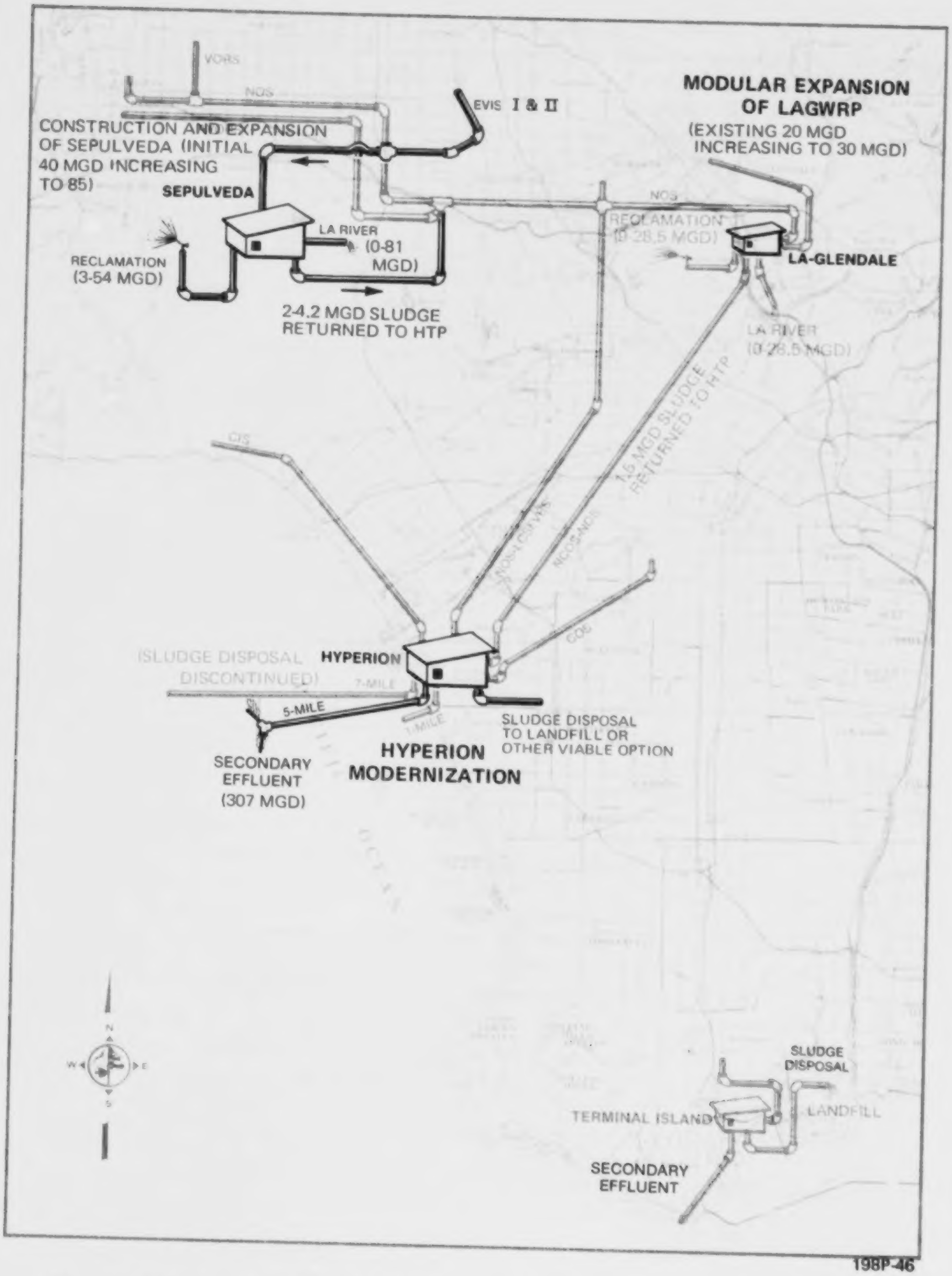
VORS
NOS
EVIS I & II
MODULAR EXPANSION
OF LAGWRP
(EXISTING 20 MGD
INCREASING TO 30 MGD)
CONSTRUCTION AND EXPANSION
OF SEPULVEDA (INITIAL
40 MGD INCREASING
TO 85)
SEPULVEDA
NOS
RECLAMATION
(0-28.5 MGD)
LA-GLENDALE
LA RIVER
(0-81
MGD)
RECLAMATION
(3-54 MGD)
2-4.2 MGD SLUDGE
RETURNED TO HTP
LA RIVER
(0-28.5 MGD)
1.5 MGD SLUDGE
RETURNED TO HTP
CIS
NOS-LCS-VWS
NCOS-NOS
COS
(SLUDGE DISPOSAL
DISCONTINUED)
HYPERION
7-MILE
5-MILE
1-MILE
SLUDGE DISPOSAL
TO LANDFILL OR
OTHER VIABLE OPTION
SECONDARY
EFFLUENT
(307 MGD)
HYPERION
MODERNIZATION
N
W
E
S
SLUDGE
DISPOSAL
TERMINAL ISLAND
LANDFILL
SECONDARY
EFFLUENT

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Figure VII-3. A schematic diagram of Alternative B4 with expanded inland treatment at Sepulveda.

quantities of reclaimed water at the Sepulveda Flood Control Basin. Sepulveda would create a potential source of reclaimed water in the San Fernando Valley for future activities including recreation, irrigation, and industry. The relief brought to the NOS-LCSFVRS system would prevent overflows into Ballona Creek except under severe wet weather conditions and the I/I corrections common to all projects may be able to remove even the severe weather overflows.

Alternative B4 was considered with several different construction schedules for expansion of inland facilities. These are presented on Table VII-3. All schemes result in 307 mgd capacity at HTP and 95 mgd capacity inland.

Table VII-3. Treatment schemes for Alternative B4.

SCHEME	1977	1980	1988	1993	1995	1998
B4A	307 mgd HTP 40 mgd SWRP	40 mgd SWRP	—	5 mgd SWRP	10 mgd LAGWRP	—
B4B	307 mgd HTP 40 mgd SWRP	40 mgd SWRP	—	10 mgd LAGWRP	—	5 mgd SWRP
B4C	307 mgd HTP 40 mgd SWRP	30 mgd SWRP	10 mgd LAGWRP	15 mgd SWRP	—	—
B4D	307 mgd HTP 40 mgd SWRP	30 mgd SWRP 10 mgd LAGWRP	—	15 mgd SWRP	—	—
B4E	307 mgd HTP 40 mgd SWRP	20 mgd SWRP 10 mgd LAGWRP	15 mgd SWRP	—	10 mgd SWRP	—

Infiltration of treated wastewater into usable groundwater can be expected to increase if any of the B series alternatives is adopted, since the bottom of the Los Angeles River is unlined for several miles below the Sepulveda Facility discharge point. Some infiltration will exist in any event with startup of the Los Angeles-Glendale Water Reclamation Plant. High reliability is required in any of the inland plants, to minimize potential discharge of inadequately treated wastewater into the river.

Alternative B5 would involve construction of several small treatment plants (5 to 10 mgd capacity) at unspecified locations offering reclamation potential. This alternative is not considered in depth in the Facilities Plan, because of the potential high cost factors (land cost, increased cost per volume treated with decreasing plant size), doubtful public acceptance (many of the potential sites are in primarily residential areas), and inadequacy for providing desired hydraulic relief for the San Fernando Valley.

Major sewer interceptor lines, coming south along the coast and southwest from Central City and the San Fernando Valley, cross Ballona Creek on their way to Hyperion Treatment Plant.

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Unlined portions of the Los Angeles River permit infiltration of storm water and urban runoff in the Los Angeles Narrows.

3. COASTAL ALTERNATIVES

The ocean discharge, or all-coastal alternatives (C series) provide all required capacity at Hyperion, except for the 20 mgd (effective 19 mgd with sludge return) available when the Los Angeles-Glendale Water Reclamation Plant becomes fully operational. Hyperion would provide full secondary treatment for all inflow, and effluent would be discharged to the ocean. Sludge would be dewatered and landfilled, ceasing sludge discharge to the ocean. Hyperion would ultimately require expansion to approximately a 405 mgd capacity. Three alternatives have been considered for providing hydraulic relief for the NOS-LCSFVRS interceptor system in conjunction with C Series alternatives: construction of retention basins, pumping of flows between interceptor sewers, and construction of new interceptor sewers.

Alternative C1, construction of retention basins, would take advantage of the fact that flows are not constant over a given day, and decrease on weekends and holidays. It is thus possible to store wastewater at points above overloaded lines during peak flow periods, and release it at night and on weekends to maintain reasonably constant flow in the interceptors. Details of the size, proposed locations, and land requirements for feasible basins are not provided in the Facilities Plan.

Alternative C2, pumping of flows between interceptor sewers, would take advantage of the fact that the NCOS-NOS interceptor line in the Hyperion System will have excess capacity while carrying year 2000 flows. This capacity could be used to relieve the NOS-LCSFVRS interceptor that would otherwise be operating over capacity, through diversion or pumping. No specific proposals are presented in the Facilities Plan.

Alternative C3, the primary coastal alternative, would involve construction of an additional tunnel (AVORS) to relieve the projected over-capacity flows in the tunnel portion of the NOS-LCSFVRS system. (The projected tributary peak flow to this tunnel in the year 2000 is 44 mgd in excess of its capacity.)

Alternative C3 is schematically depicted in Figure VII-4. The AVORS would discharge into the newer NCOS, and thus relieve the NOS system and reduce the possibility of overflow and impact upon Ballona Creek. As with each alternative, this coastal treatment with the AVORS interceptor sewer system would include nonmarine sludge disposal and secondary treatment for wastewater discharged into the marine environment.

4. ZERO DISCHARGE ALTERNATIVES

The zero discharge alternative (Alternative D) suggests total elimination of discharges to receiving waters. (PL 92-500 has set a national goal for elimination of pollutant discharges to navigable waters by 1985.) Treated wastewater would have to be evaporated or totally reclaimed.

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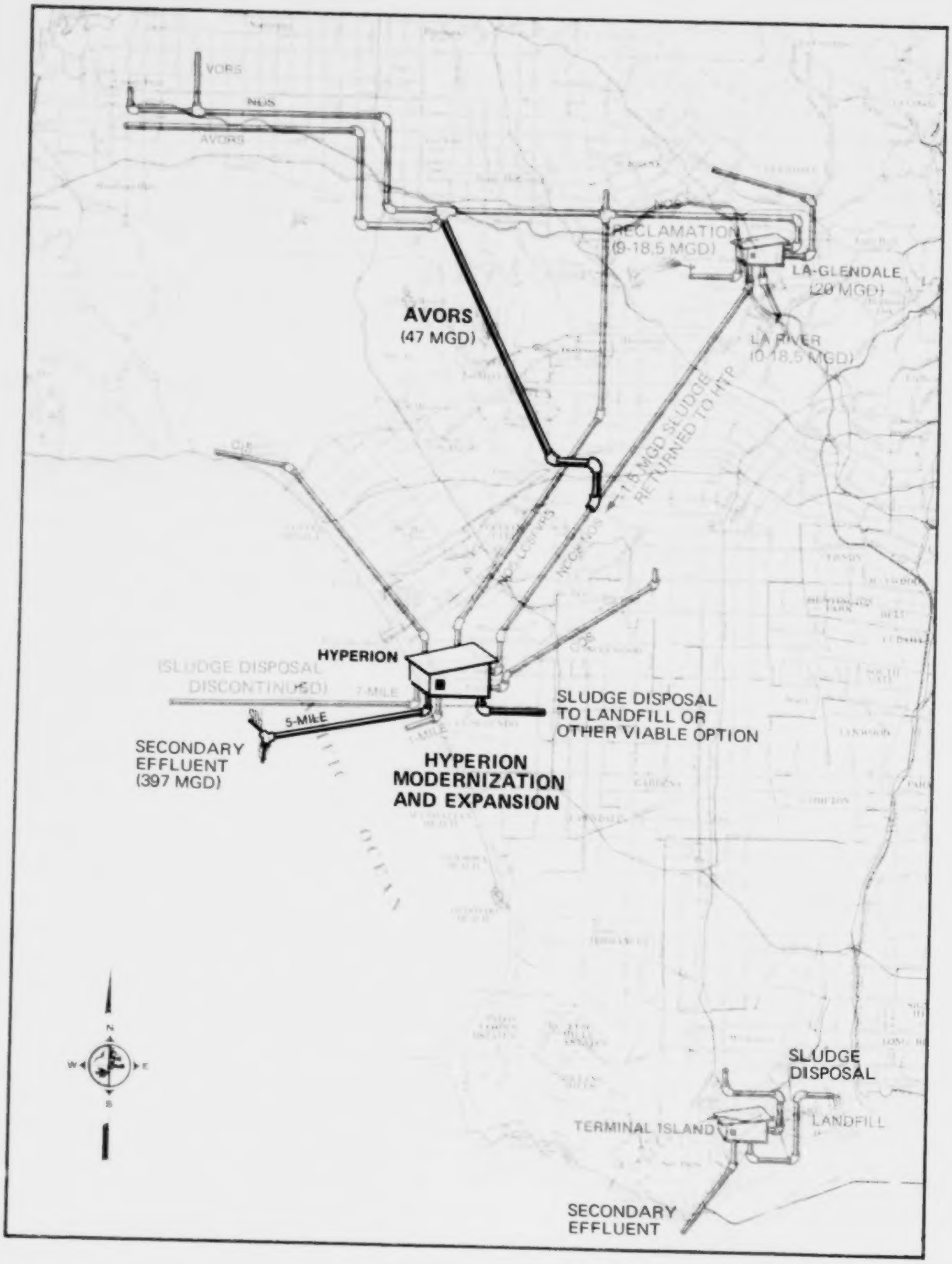
VORS
NOS
AVORS
RECLAMATION
(9-18.5 MGD)
LA-GLENDALE
(20 MGD)
AVORS
(47 MGD)
LA RIVER
(0-18.5 MGD)
1.5 MGD SLUDGE
RETURNED TO HTP
NOS
C/E
HYPERION
(SLUDGE DISPOSAL
DISCONTINUED)
7-MILE
5-MILE
1-MILE
SECONDARY
EFFLUENT
(397 MGD)
HYPERION
MODERNIZATION
AND EXPANSION
SLUDGE DISPOSAL
TO LANDFILL OR
OTHER VIABLE OPTION
OCEAN
N
W
E
S
SLUDGE
DISPOSAL
TERMINAL ISLAND
LANDFILL
SECONDARY
EFFLUENT

Figure VII-4. Alternative C3 includes an AVORS tunnel and expanded coastal treatment.

Two evaporation sites were considered by the City: the Antelope Valley, and the San Jacinto Valley. The estimated capital costs for such disposal are $1.6 billion, with yearly operating costs of $50 million and a yearly power consumption of 2.7 trillion kilowatt-hours. This power consumption is equivalent to the output of a power station capable of delivering 0.31 megawatts, or 3.8 percent of the rated capacity of the Scattergood Power Plant. "Off-peak" pumping is probably not feasible, since it would require daytime storage of the wastewater. The high economic and energy costs of this alternative were considered sufficient to exclude it from further consideration.

5. MAXIMUM RECLAMATION ALTERNATIVES

The maximum reclamation alternatives (E series) all include construction of a water reclamation plant at La Cienega near the confluence of the NOS and LCSFVRS interceptors at the northern edge of Baldwin Hills. This would produce 75 mgd of reclaimed water in addition to that proposed at other inland facilities. Potential uses for reclaimed water include industrial processes (e.g., cooling), irrigation, recreation, groundwater replenishment by spreading (when acceptable to the State Department of Health), fire fighting, and injection into seawater intrusion barriers. These uses and the general viability of water reclamation are discussed in Addenda 1 and 2 to this EIS.

Alternative E1 would require 232 mgd of secondary treatment at HTP and 75 mgd at LCWRP by 1985 in order to meet federal requirements. Another 85 mgd of reclaimed water would be produced at Sepulveda and 30 mgd at LAGWRP. Because the scheduled date for operation of LCWRP in Alternative E1 is probably unrealistic, Alternative E2 was proposed, which includes 307 mgd at HTP until LCWRP is on line. HTP could then be converted to 232 mgd, including 50 mgd with advanced treatment. Ultimately, 240 mgd, or almost 60 percent of the projected year 2000 flow in the Hyperion service area, would receive advanced treatment. Figure VII-5 illustrates major elements of Alternative E2.

Alternative E3 is essentially the same as E2 except that the flexibility for converting HTP to 232 mgd would not be built into the initial system. This would mean more costly conversion later, if reclamation became desirable.

Alternative EX, not described in the Facilities Plan, is added for consideration here as a project similar to E2 but with AVORS and the Woodman Avenue Relief Sewer (similar to EVIS) instead of the Sepulveda Water Reclamation Plant. Alternative EX would start with a 397 mgd secondary treatment unit at the Hyperion Treatment Plant. In addition, flexibility would be incorporated for later revisions in capacity at Hyperion. Sludge processing and disposal are also included at the Hyperion site. The La Cienega Water Reclamation Plant and the 10 mgd addition to the LA-Glendale Water Reclamation Plant would be constructed as proposed for Alternative E2. The San Fernando Valley would be served by AVORS, with the Woodman Avenue Relief Sewer enlarging the service area.

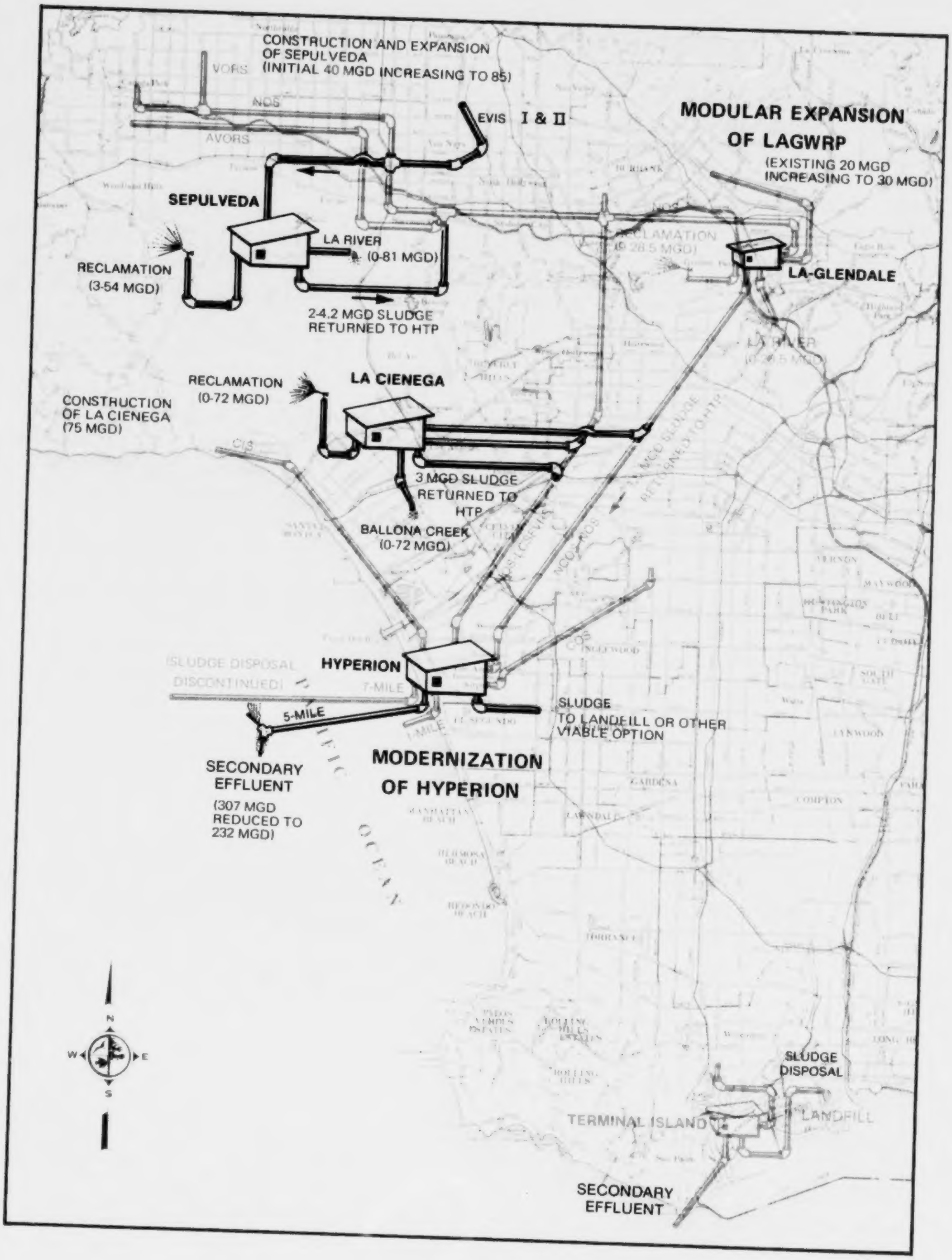
CONSTRUCTION AND EXPANSION OF SEPULVEDA (INITIAL 40 MGD INCREASING TO 85)
VORS
NOS
AVORS
EVIS I & II
MODULAR EXPANSION OF LAGWRP
(EXISTING 20 MGD INCREASING TO 30 MGD)
SEPULVEDA
LA RIVER (0-81 MGD)
RECLAMATION (3-54 MGD)
2-4.2 MGD SLUDGE RETURNED TO HTP
RECLAMATION (9-28.5 MGD)
LA-GLENDALE
LA RIVER (0-26.5 MGD)
RECLAMATION (0-72 MGD)
LA CIENEGA
CONSTRUCTION OF LA CIENEGA (75 MGD)
CIS
3 MGD SLUDGE RETURNED TO HTP
MGD SLUDGE RETURNED TO HTP
BALLONA CREEK (0-72 MGD)
NCOS
COS
SLUDGE DISPOSAL DISCONTINUED
HYPERION
7-MILE
5-MILE
1-MILE
SLUDGE TO LANDFILL OR OTHER VIABLE OPTION
SECONDARY EFFLUENT (307 MGD REDUCED TO 232 MGD)
MODERNIZATION OF HYPERION
PACIFIC OCEAN
N
W
E
S
SLUDGE DISPOSAL
TERMINAL ISLAND
LANDFILL
SECONDARY EFFLUENT

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Figure VII-5. Major elements of Alternative E2.

6. COMBINED SYSTEMS ALTERNATIVES

The possibility of combining treatment facilities with other agencies was also considered in F series alternatives. The object would be to achieve efficiency and economy by treating the wastewater-disposal problem on an area-wide or basin-wide scale. Alternative F1 would combine treatment systems with Los Angeles County Sanitation Districts, whereas Alternative F2 would combine with Las Virgenes-Triunfo-Malibu-Topanga systems. This approach will not solve the over-all problems required in meeting regulatory requirements regarding secondary treatment and sludge disposal and were given no thorough consideration in the Facilities Plan.

7. TREATMENT OF STORM RUNOFF

Treatment of storm runoff was considered under Alternative G. Runoff after the first storm of the season usually contains a significant concentration of pollutants, which enter receiving waters through the storm drain system rather than the sewer system. The problem is area-wide, and cannot be solved by the City of Los Angeles acting alone.

8. IMPROVED MANAGEMENT, OPERATIONAL, AND MAINTENANCE PROCEDURES

Improved management, operational, and maintenance procedures were considered under Alternative H. Improved procedures cannot solve the basic problems of meeting regulatory requirements or provide the additional facilities necessary to meet present or projected needs. The City presently selects all supervisory and operating personnel on the basis of competative examinations, and maintains an active education and training program.

Environmental impacts could occur through operator error or inadequate facility maintenance. However, these potential impacts are not considered to be significant when compared with the basic impacts of over-all system and process selection.

C. screening of alternatives

C. SCREENING OF ALTERNATIVES

1. INITIAL SCREENING

An initial screening process presented in the Facilities Plan and summarized in Table VII-4 was used to select viable alternatives for further consideration. The A series alternatives were eliminated because of failure to meet federal and state requirements regarding ocean discharges. For the purpose of this EIS, Alternative A1 is included for further analysis because of the federal requirement to consider "No Project" as an alternative. Alternatives CX and EX, which were not addressed in the Facilities Plan, also receive further consideration in this EIS.

The alternatives considered viable in the initial Facilities Plan screening were B1, B3, B4 (plus all sub-plans), C3, E2, E3, and F2. Although Alternative F2 was considered viable, it was eliminated from further consideration since implementation would be contingent upon the actions taken by the sanitation agencies which have jurisdiction of the Los Angeles County, Las Virgenes and Malibu-Topanga service areas.

2. COST EFFECTIVENESS SCREENING

The Facilities Plan presents cost analyses for viable alternatives. These are summarized in Tables VII-5 and VII-6. (Elements of Facilities Plan Tables VIII-22 and VIII-23 were used for these tables. The calculations were based on different criteria so that E series costs shown on Table VII-6 may not be legitimately compared to the B series costs shown on Table VII-5.)

On the basis of cost screening, a single B alternative and a single E alternative were selected for further consideration, and Alternative C3 was retained from the initial screening for the C series. The selection in the Facilities Plan was thus reduced to B4C, C3, and E2.

The extra alternatives, CX and EX , considered for the EIS were given cost-effectiveness consideration and Alternative EX was eliminated from further consideration.

3. COSTS OF ALTERNATIVES RECEIVING FINAL CONSIDERATION

The final list of alternatives selected for consideration in the EIS is A1, B4C, C3, and E2. Costs for construction and operation are presented

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Table VII-4. Summary of initial screening of alternatives.

ALTERNATIVES	VIABILITY	REMARKS
A1. HTP not converted to full secondary treatment and no other sewer construction.	NO	Will not meet ocean discharge requirements.
A2. HTP not converted to full secondary treatment, however, new sewer to provide hydraulic relief.	NO	Will not meet ocean discharge requirements.
B1. HTP expansion and modernization, construct 40 mgd SWRP, and no inland plant expansion.	YES	Requires 359 mgd HTP and SWRP provides hydraulic relief to NOS-LCSFVRS.
B2. No HTP modernization, construct 40 mgd SWRP, and expand SWRP and LAGWRP.	NO	No HTP modernization reduces cost-effective capacity to 270 mgd and requires additional collection system-pumping plants to provide flows to SWRP and LAGWRP.
B3. HTP expansion and modernization, construct 40 mgd SWRP, and expand SWRP only.	YES	Total required capacity at SWRP exceeds tributary gravity flow necessitating collection system-pumping plants for additional 10 mgd.
B4. HTP expansion and modernization, construct 40 mgd SWRP and expand SWRP and LAGWRP.	YES	SWRP expanded to 85 mgd and LAGWRP to 30 mgd with various size additions and dates.
Scheme A: Expand SWRP in 1980 (40 mgd) and 1993 (5 mgd) and LAGWRP in 1995 (10 mgd).	YES	Construction sequence will provide hydraulic relief to HTP and NOS-LCSFVRS during planning period.
Scheme B: Expand SWRP in 1980 (40 mgd) and 1998 (5 mgd) and LAGWRP in 1993 (10 mgd).	YES	Same as Scheme A.
Scheme C: Expand SWRP in 1980 (30 mgd) and 1993 (15 mgd) and LAGWRP in 1988 (10 mgd).	YES	Same as Scheme A.
Scheme D: Expand SWRP in 1980 (30 mgd) and 1993 (15 mgd) and LAGWRP in 1980 (10 mgd).	YES	Same as Scheme A.
Scheme E: Expand SWRP in 1980 (20 mgd), 1988 (15 mgd), and 1995 (10 mgd) and LAGWRP in 1980 (10 mgd).	YES	Same as Scheme A.
B5. HTP expansion and modernization, construct 40 mgd SWRP and small inland reclamation plants.	NO	Construction of 5 mgd to 10 mgd inland plants near areas of reuse. Cost, site and public acceptance is questionable.
C1. All new treatment at HTP and construction of inland retention basins.	NO	Construction of large retention basins to store excessive flows during peak periods to provide hydraulic relief of NOS-LCSFVRS. Requires large site, may have odor problems and flows must be monitored.
C2. All new treatment at HTP with pumping of flows between interceptor sewers.	NO	Requires construction of 396 mgd HTP within limited Hyperion site. Pumping and force main systems would be complex and energy consuming.
C3. All new treatment at HTP with construction of relief sewer.	YES	Requires construction of 396 mgd HTP within limited Hyperion site and major relief sewer through Santa Monica Mountains.
D. Effluent evaporation.	NO	No ocean disposal of effluent. Effluent disposal by evaporation at distant sites. Capital and O & M costs and energy consumption high.
E1. Maximum reclamation - 232 mgd HTP and 75 mgd LCWRP in 1985.	NO	Requires HTP to treat 307 mgd with polymer addition and acquisition of La Cienega site by 1985 questionable.
E2. Maximum reclamation - 307 mgd HTP with flexibility for conversion to 232 mgd and 75 mgd LCWRP in 1985.	YES	Provides for minimizing conversion costs when wastewater reuse becomes viable and provides standard treatment until La Cienega site available.
E3. Maximum reclamation - 307 mgd HTP with no flexibility for conversion to 232 mgd and 75 mgd LCWRP in 1985.	YES	HTP same as under Alt. B4 thereby minimizes initial costs if reclamation is not viable. If reclamation is viable, convert HTP to 232 mgd and construct 75 mgd LCWRP or consider treatment plant under Alt. B4.
F1. Combining treatment systems with Los Angeles County Sanitation Districts.	NO	Requires abandonment of one large treatment plant and pumping of flows from one plant to another. Neither plant has outfall large enough to handle combined flows.
F2. Combining treatment Systems with Las Virgenes - Triunfo - Malibu - Topanga Service Area.	YES	Proposes transporting portion of Las Virgenes flows to SWRP and/or Malibu-Topanga to HTP. Implementation dependent upon their sanitation agencies.
G. Treatment of storm runoff.	NO	City has separate systems, therefore, not a sewage treatment proposal and not comparable with other alternatives. Storm runoff quantity enormous, therefore, difficult and expensive to treat.
H. Improved management, operational and maintenance procedures.	NO	As an alternative by itself, would not produce significant increase in treatment capacity but should be applied with other alternatives.

Table VII-5. Cost analysis summary of viable B-series alternatives as presented in Facilities Plan.[1]

ALTERNATIVE	PRESENT WORTH	AVERAGE COST PER MILLION GALLONS TREATED
B1. 359 mgd HTP Expansion and Modernization; 40 mgd SWRP; diversion tunnel	$407,496,000	$247
B3. 307 mgd HTP Expansion and Modernization; 40 mgd SWRP and 55 mgd Expansion	401,946,000	244
B4. 307 mgd HTP Expansion and Modernization; 40 mgd SWRP and 45 mgd Expansion; 10 mgd Expansion at LAGWRP		
Schemes		
A	400,227,000	243
B	400,021,000	242
C	398,513,000	241
D	403,515,000	245
E	401,372,000	243

[1] Costs shown are not directly comparable to those appearing later in the EIS or on Table VII-6 because of differences in the methods of calculation.

Table VII-6. Cost analysis summary of viable E-series alternatives as presented in the Facilities Plan.[1]

ALTERNATIVE	PRESENT WORTH
E2. Construct HTP with Flexibility for Conversion to 232 mgd; build La Cienega at 75 mgd; build SWRP to 85 mgd; add 10 mgd to LAGWRP	$754,700,000
E3. Construct HTP without Flexibility for Conversion to 232 mgd; build La Cienega at 75 mgd; build SWRP to 85 mgd; add 10 mgd to LAGWRP	762,400,000

[1] Costs shown are not directly comparable to those appearing later in the EIS or on Table VII-5 because of differences in the methods of calculation.

in Table VII-7. The "No Project" alternative is the least costly in direct monetary expenses with a total of about half that of other alternatives. Alternative E2 is most costly in direct monetary terms. The direct monetary expenses of alternatives as shown in Table VII-7 do not include project benefits. Because of the importance of environmental considerations, particularly secondary impacts, the EIS gives full consideration to all of these alternatives. The EIS presents a full assessment of impacts of Alternatives A1, B4C, C3, CX, and E2, independent of the assessment contained in the Facilities Plan.

Table VII-7. Costs (1975 dollars) and present worths for alternatives receiving final consideration.

	A1 NO PROJECT	B4C	C3	E2
Total Construction Cost	$121,959,000	$276,566,000	$347,057,000	$343,155,000
Total Operational Cost	$235,390,000	$452,561,000	$402,734,000	$511,061,000
Total Project Cost	$357,349,000	$729,127,000	$749,791,000	$854,216,000
Construction Present Worth	$96,713,000	$200,881,000	$274,051,000	$242,298,000
Operational Present Worth	$104,934,000	$189,627,000	$168,670,000	$207,684,000
Total Present Worth	$201,647,000	$390,508,000	$442,721,000	$449,982,000

Note: These are the costs presented in the preliminary drafts of the Facilities Plan. They are expected to change after the Draft Facilities Plan is published (simultaneous with the EIS) and undergoes review by concerned agencies.

Estimated project costs are subject to change following review of the Draft Facilities Plan. Some of the design uncertainties potentially affecting cost estimates include questions regarding availability of land at the Hyperion site. The costs for Alternative C3 include the very high costs of placing a retaining wall behind the facility, apparently increasing the costs by $60 million. The question is whether in lieu of the retaining wall, it would be possible to place the additional facilities on other sites at Hyperion or in the adjacent industrial complexes. This issue is further discussed in the Facilities Plan.

The Facilities Plan notes that a 150 mgd secondary facility (or tertiary) could be constructed in an undeveloped parcel of Standard Oil land for approximately $54 million. However, this is not a viable possibility because the land is not available to the City of Los Angeles.

The proposed Sepulveda facility has already been designed. Because of NPDES changes in discharge criteria, design and revisions will probably be needed to meet higher discharge requirements. The operational LA-Glendale facility also will have to meet these requirements.

All of the alternatives developed above include the removal and replacement of the existing secondary treatment facilities. These facilities are capable of treating flows in the neighborhood of 150 mgd, although they are presently operated at 100 mgd so as to attain a very high quality effluent (much higher than secondary requirements). Aside from the question of whether it is cost-effective to remove these facilities, there remains the issue of the impact on the marine environment of discontinuing, for a period of years, the secondary treatment.

On November 8, 1976, the State Water Resources Control Board (SWRCB) heard the City's appeal of the decision not to permit the secondary treatment facility demolition. The summarized arguments are presented below. For clarification, references to the "oxygen system" refer to proposals to demolish the existing "air" system, and replace it with an "oxygen system" plus adding additional oxygen facilities. The "dual system" would retain existing "air" facilities, and add "oxygen" facilities.

City Oxygen System Argument:

1. The complete oxygen system is more economical than the dual air-oxygen system by nearly $22 million based on total present worth. The capital cost difference is $6 million less for the complete oxygen system.
2. The complete oxygen system will discharge 24,200 tons less BOD and 39,400 tons less suspended solids than the dual system during the construction phase.
3. Public reaction to removal of the existing system would be less harsh than public reaction to a longer, more costly alternative.
4. The 42,000 cubic yards of demolished reinforced concrete can easily be disposed of in the existing Mission Canyon Landfill with less impact than the removal of 209,000 cubic yards of sand that would be required by the dual system.
5. The complete oxygen system will provide a fully operational secondary facility 18 months earlier than the dual system.
6. The complete oxygen system commits 21.8 percent less energy resources to its operation than does the dual system.
7. A public hearing on the Hyperion upgrading was held on March 24, 1976, and there was no concern expressed over the removal and reconstruction of the existing secondary facilities. In addition, none of the written comments received expressed concern with this issue.

Dual System Argument:

1. The total oxygen system has not been proven to be cost-effective, and, in fact, appears to us to be more costly than the dual system by about $14 million.

2. The dual system can be in operation at least as early as the complete oxygen system, and possibly 6 months earlier.
3. The net discharge of pollutants to the ocean is significantly less for the dual system than for the complete oxygen system.
4. The dual system better facilitates future reclamation of Hyperion's waste to industrial reuse.
5. Attention focused on the grant program due to the destruction of a sound public sewerage system could threaten public support for the clean water grant effort.

On February 17, 1977, the Board ruled that the City should plan for removal of the existing secondary. EPA has still not reached a final determination on the environmental consequences of the secondary facility demolition. Public comment on this issue is particularly solicited. The Final EIS will present the final decision and the rationale for the decision.

LA-Glendale expansion to 30 mgd with Alternative C3 apparently was not pursued in the Facilities Plan.

The money earned by selling reclaimed water has not been included in the cost-benefit analysis for Alternative E2. This would tend to lower the costs of the reclamation alternative. Appendix F to the Facilities Plan compares potential costs and impacts of producing equal quantities of reclaimed water with Alternatives B4C and E2. In the reclamation analysis, Alternative B4C is augmented to result in production of reclaimed water equal to that provided by Alternative E2. Table VII-8 presents cost comparisons between Alternative E2 and augmented Alternative B4C. Results of the study presented in Appendix F to the Facilities Plan indicate that implementation of augmented Alternative B4C would result in increased requirements for dollars, energy, land, and revenue support as compared to the same level of water reclamation under Alternative E2.

4. SUBSIDIARY PROJECT ALTERNATIVES

There are three important possibilities for alternative project designs. These involve the issue of chlorination, the issue of whether or not to remove existing secondary clarifiers at Hyperion, and the issue of what type of secondary treatment would be most cost-effective. For each of these issues, one or more alternatives to the project as described in the draft Facilities Plan are possible.

a. Chlorination. The advisability of chlorination as a means of disinfection for marine discharges has been questioned because fecal

Table VII-8. Cost analysis of HTP and LCWRP sewage treatment plus water reclamation.

IDENTIFICATION OF SYSTEM	SYSTEM CAPITAL AND O&M COSTS, 1975 DOLLARS IN MILLIONS	
	ALTERNATIVE E2	ALTERNATIVE B4
Sewage Treatment for Ocean Disposal		
Hyperion TP (1980)	$449 (307 mgd)[2]	$468 (307 mgd)
La Cienega WRP (1985)	$111 (75 mgd)	
Water Reclamation[1]		
System Alternative No. 1	$206	$221
System Alternative No. 2	276	301
System Alternative No. 3	245	271
System Alternative No. 4	315	351
System Alternative No. 5	269	326
System Alternative No. 6	339	402
Total—Range based on Water System Alternative	$766-$899	$689-$870

[1] SYSTEM ALTERNATIVE DESCRIPTION

	System Alternatives and Level of Use (mgd)					
	1	2	3	4	5	6
Standard Oil Refinery	8	8	8	8	8	8
SW Los Angeles Industries	30	30	52	52	52	52
West Coast Basin Barrier		35		35		35
Vernon Industries					20	20
Total Use	38	73	60	95	80	115

[2] Constructed with pure oxygen secondary system for 307 mgd with flexibility for conversion to 232 mgd with fine-bubble secondary system.

coliform bacteria (and probably most other potential pathogens) would be killed in seawater anyway, and because of the production of toxic compounds as a result of chlorination. The need for chlorination of marine discharges is now decided on a case-by-case basis. Although the Facilities Plan proposes no chlorination of HTP effluents (except when the 1-mile outfall is used), permit approval has not yet been obtained and the alternative possibilities will require further review.

For effluent discharges to inland waters, disinfection could be achieved through ozonation rather than chlorination. This alternative would avoid the impacts resulting from the production of toxicants during the chlorination process. Ozone has been shown to reduce the concentrations of bacteria and viruses in wastewater more effectively than chlorine (Rosen, 1973). Other advantages of ozone are reduction of BOD and COD, increased DO, oxidation of many chemicals and organics (such as phenolics), and odor control (Rosen, 1973; Morris, undated). Ozone is likely to be cost-competitive in larger treatment plants—that is, on the order of 80 mgd or larger (Valley, 1977, personal communication), even though the equipment for producing ozone is expensive, and relatively large amounts of power are required. Further consideration of chlorination and related alternatives is expected.

b. Clarifiers. The existing secondary treatment process at HTP (treating about 100 mgd) produces an extremely high quality effluent. The Facilities Plan proposes removal of the existing clarifiers in order to install facilities for full secondary treatment. The cost-effectiveness of this proposal requires further review. Also, removal of the existing system would result in reversion to only primary treatment for a period of about 3 years during the construction phase.

c. Secondary Treatment Methods. Associated with the issue of whether or not to remove the existing secondary clarifiers is the question of what method of secondary treatment would be best. The three major possibilities which exist are (1) standard air processes, either deep turbine or diffuse bubble systems; (2) oxygen systems; and (3) physical-chemical processes. The air system would produce an effluent generally lower in nutrients than the oxygen system. This would not be an advantage for marine discharges, but would make reclamation more feasible. Some of the other arguments were presented in Section 3 above, and the issue warrants further consideration.

D. detailed description of alternatives receiving final consideration

D. DETAILED DESCRIPTION OF ALTERNATIVES RECEIVING FINAL CONSIDERATION

1. NO PROJECT (A1)

The only changes to existing conditions that would result from the No Project alternative are modernization of Hyperion treatment facilities and an increase in capacity of Hyperion to provide secondary treatment up to 200 mgd. No new construction would be undertaken at any other site, and no change would be implemented in sludge disposal procedures. (The Interim Sludge Processing and Disposal Program has not been included in this No Project discussion but can be implemented with or without any other project elements.) Only minor repairs and maintenance would be made as necessary to maintain existing systems.

The following modifications to HTP would be made under the No Project alternative:

Phase I:

- Headworks and Primary Tank System (adding approximately 40 mgd of primary treatment capacity)
- Primary Tanks Modernization
- Administration Building

Phase II:

- Effluent Eductor for Ocean Discharge
- Digester Modernization

These projects are described further in the description of Alternative B4C. They are elements of the Facilities Plan proposed project (B4C) that can be initiated prior to approval of the Facilities Plan. The location of HTP is shown on Figure VII-6.

Construction of the No Project alternative would require 2,132 man-years of labor and cost $121,959,000 (1975 dollars). During operation, ten additional employees would be required at HTP, bringing the total to 260. Over the life of the project, approximately $235,390,000 would be spent on operations and maintenance. Costs are summarized in Table VII-9.

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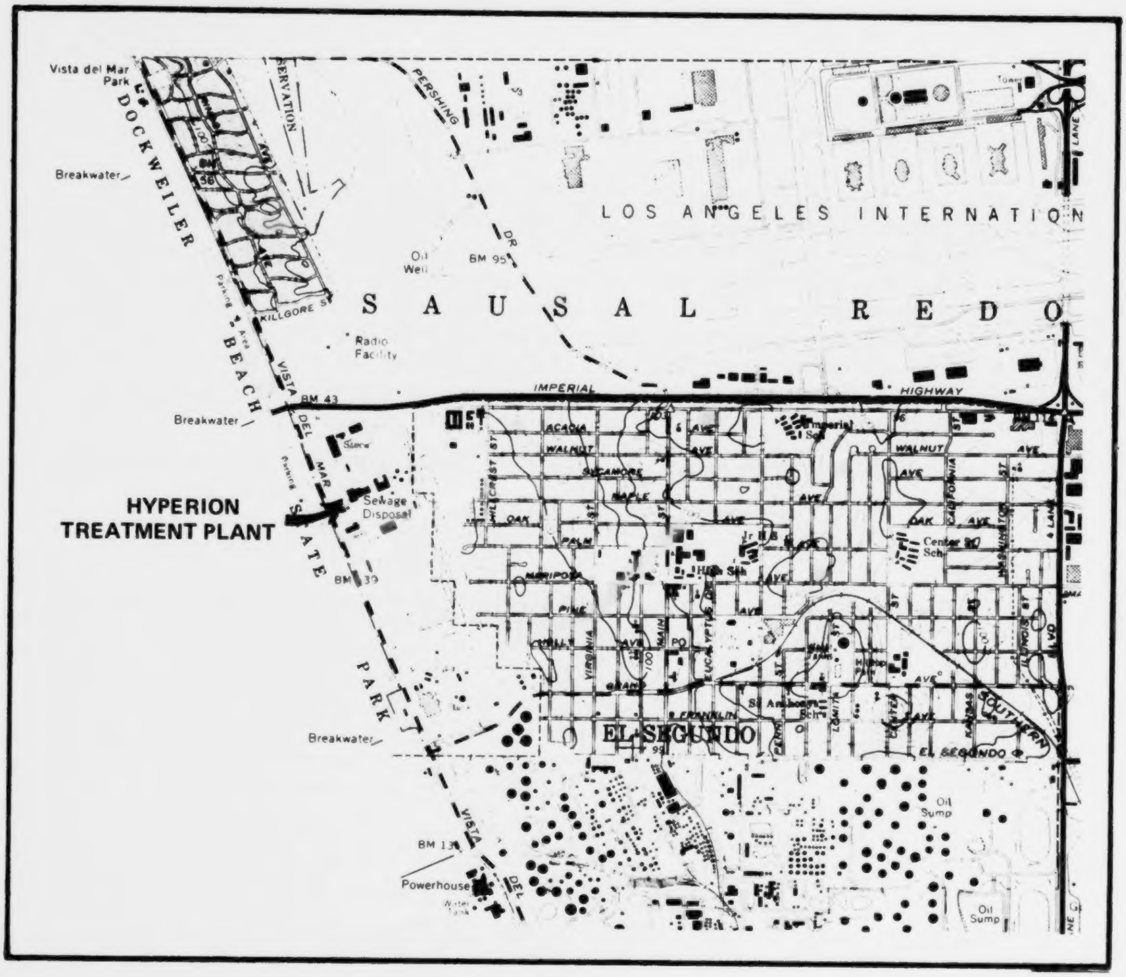
Vista del Mar Park
DOCKWEILER
Breakwater
KILLGORE ST
BEACH
Breakwater
HYPERION TREATMENT PLANT
Sewage Disposal
STATE
BM 39
PARK
Breakwater
BM 13
Powerhouse
Water Tank
VISTA DEL MAR
BM 43
PERSHING DR
Oil Well
BM 95
Radio Facility
LOS ANGELES INTERNATION
SAUSAL REDO
IMPERIAL HIGHWAY
ACACIA
WALNUT
SYCAMORE
MAPLE
OAK
PALM
MARIPOSA
PINE
HOLLY
GRAND
FRANKLIN
EL SEGUNDO
AVE
Imperial Sch
Jr H S
High Sch
Center St Sch
St Anthonys Sch
SOUTHERN
CALIFORNIA
VIRGINIA
EUCALYPTUS
EL SEGUNDO
Oil Sump
Oil Sump

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Figure VII-6. Location of the Hyperion Treatment Plant.

Table VII-9. Costs for major elements of Alternative A1 (in 1975 dollars).

PROJECT ELEMENT	CONSTRUCTION COST	OPERATION COST	TOTAL COST
HTP Modernization (+ up to 200 mgd secondary)	121,959,000	235,390,000	357,349,000
TOTAL	121,959,000	235,390,000	357,349,000

Effluents from the No Project system would be as follows:

- 200 mgd secondary effluent discharged through the HTP 5-mile outfall.
- 214 mgd primary effluent discharged through the HTP 5-mile outfall.
- sludge from LAGWRP and HTP discharged through the HTP 7-mile outfall.
- 9-18.5 mgd tertiary effluent from LAGWRP discharged to the Los Angeles River.

Construction and operation of the No Project alternative would be the same as portions of the construction and operation described for Alternative B4C in the next section. Primary treatment only would be provided for about half the HTP effluent. The other half would receive secondary treatment the same as described for other alternatives. Other operations would not change from existing conditions.

2. INLAND-COASTAL SPLIT OF TREATMENT CAPACITY (B4C)

The alternative designated the preferred project by the City of Los Angeles is Alternative B4C. Major elements of this alternative include provision of 307 mgd secondary treatment at Hyperion and an initial 40 mgd tertiary treatment at Sepulveda followed by 30 mgd and 15 mgd additions to Sepulveda and a 10 mgd addition to the existing 20 mgd LA-Glendale Water Reclamation Plant. Sludge removal and disposal for all three treatment facilities would be provided at Hyperion. In addition to the three major treatment facilities recommended under this alternative, the East Valley Interceptor Sewer would be constructed in two units to increase the service area tributary to the Sepulveda Water Reclamation Plant. Reclaimed water made available by the Sepulveda and LA-Glendale Plants would be distributed for irrigation purposes through two proposed systems. Figure VII-7 shows the proposed service areas for each of the treatment plants. The sequence of construction elements constituting Alternative B4C would be as follows:

Conversion of the Hyperion Treatment Plant to a full secondary treatment facility with an average annual capacity of 307 mgd. This conversion would be performed in three overlapping phases. The construction schedule shows start of construction in late 1977, and completion of all essential operational units by the end of 1981 (DPW, 1976).

Construction of an interim sludge processing and disposal system, beginning in 1978 and operational by 1980.

Construction of the Griffith Park Reclaimed Water Delivery System in 1977-1978.

Construction of the initial unit of the Sepulveda Facility, with tertiary treatment capacity for an average flow of 40 mgd. Construction would begin in 1977, with the plant on line, 2 to 3 years later.

Construction of the first section of the East Valley Interceptor Sewer (EVIS I), beginning in 1978 and continuing for approximately 2 years.

Construction of a 9 mgd delivery and distribution system for irrigation in the Sepulveda Dam Recreation Area to be built in 1980.

Addition of a 30 mgd module to the Sepulveda Facility to be constructed in 1979-1980.

Extension of EVIS to its full design length, through construction of EVIS Unit II in 1982-1983.

Addition of a 10 mgd module to LA-GWRP to be constructed in 1988-1989.

Addition of a 15 mgd module to SF to be constructed in 1992-1993.

The costs of constructing and operating major project elements are shown in Table VII-10.

a. Hyperion Treatment Plant Conversion for Full Secondary Treatment and Sludge Disposal. Conversion of the Hyperion Treatment Plant to provide 307 mgd of full secondary treatment will require renovation or upgrading of some existing facilities, construction of additional primary sedimentation tanks, installation of aeration tanks operating with pure oxygen rather than air, provision of additional digester capacity for sludge, provision of standby chlorination facilities for the treated wastewater, addition of air-scrubbing facilities for odor control, and probable construction of an oxygen generation plant. The proposed conversion of HTP to full secondary treatment includes removal of the existing secondary facilities as discussed in Section C.4 above. An Environmental Impact Report has been prepared for this project, and provides additional details on both the project and its environmental implications (DPW, 1976).

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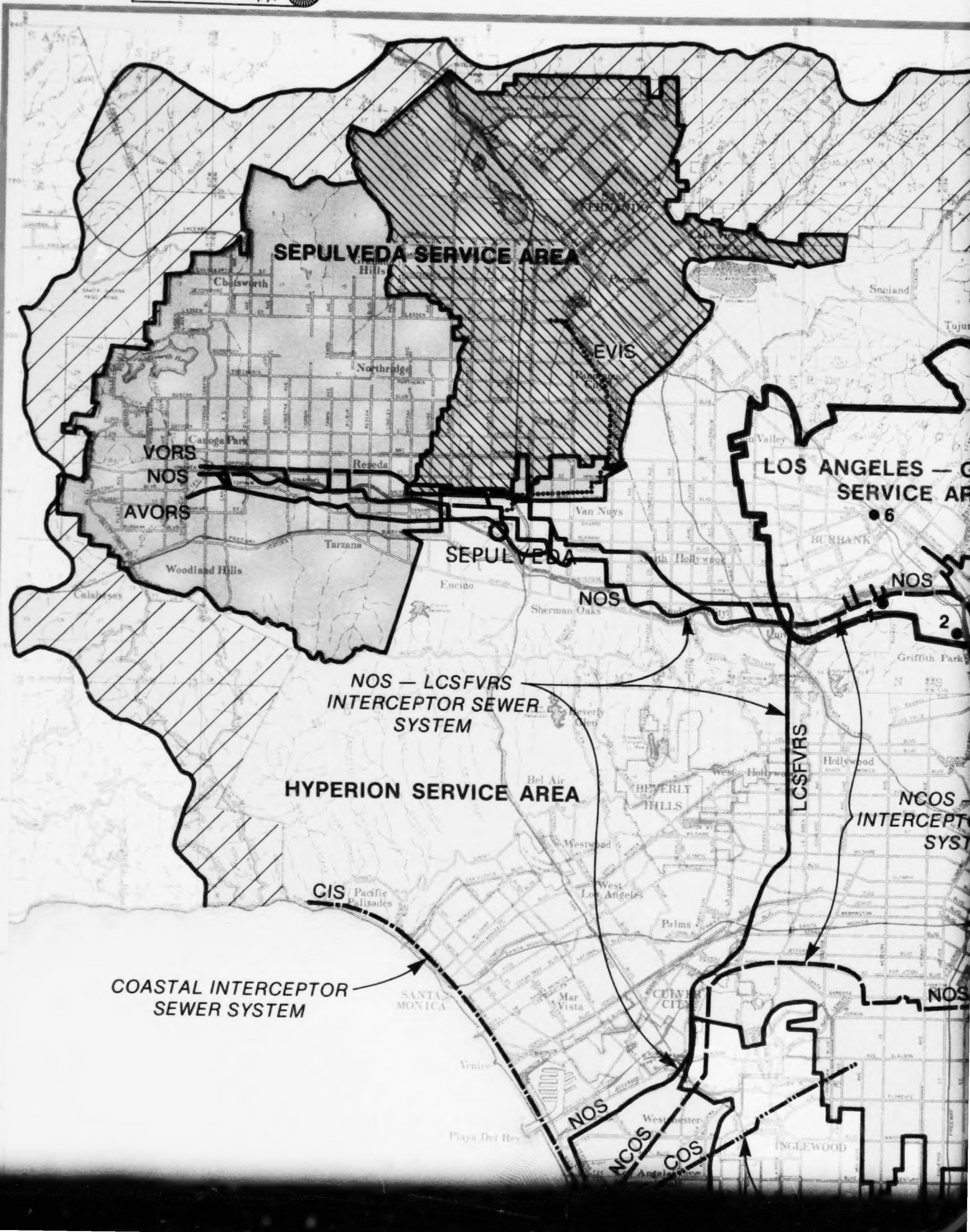
SEPULVEDA SERVICE AREA
VORS
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EVIS
LOS ANGELES — G
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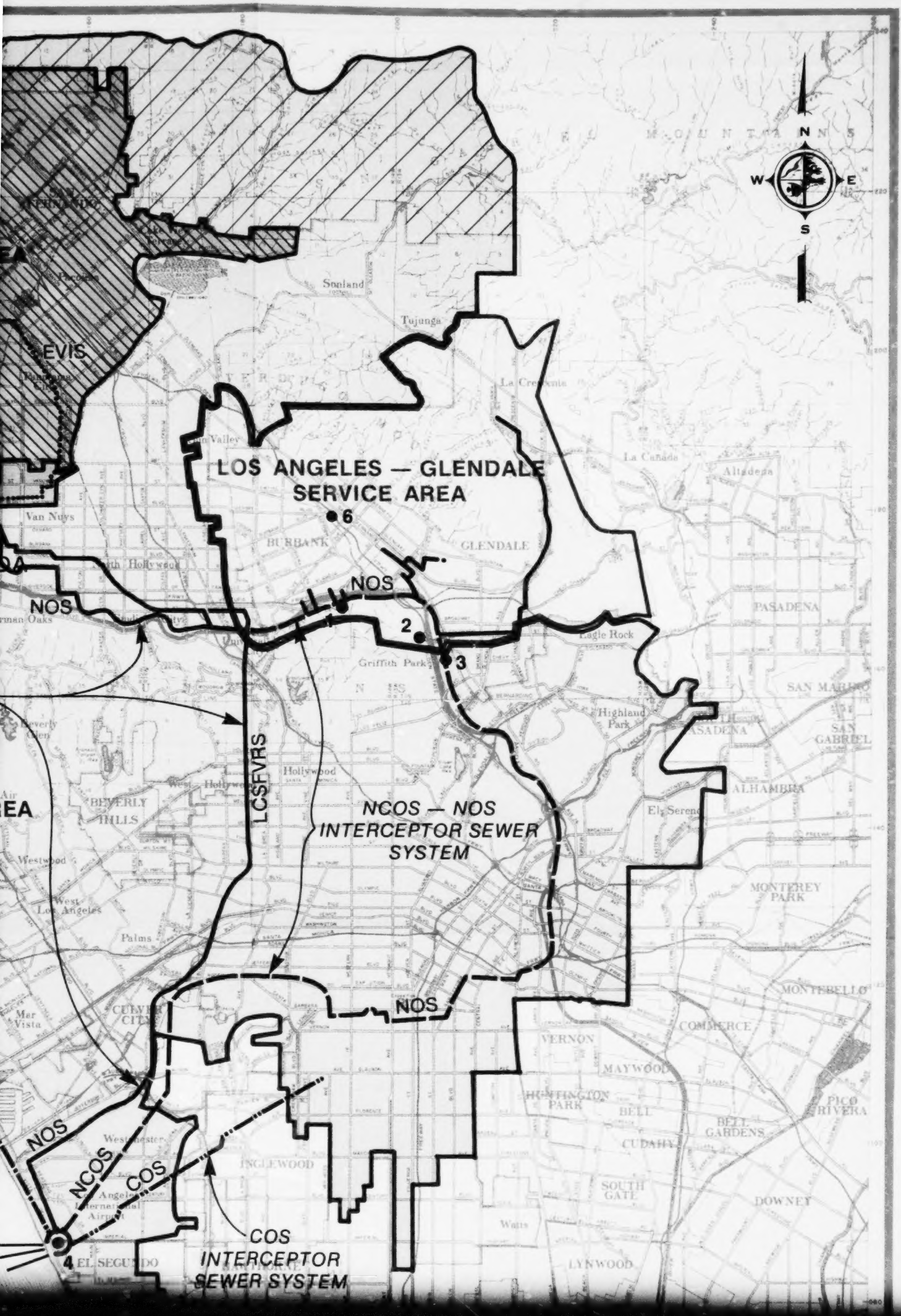
LOS ANGELES — GLENDALE SERVICE AREA
6
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NCOS
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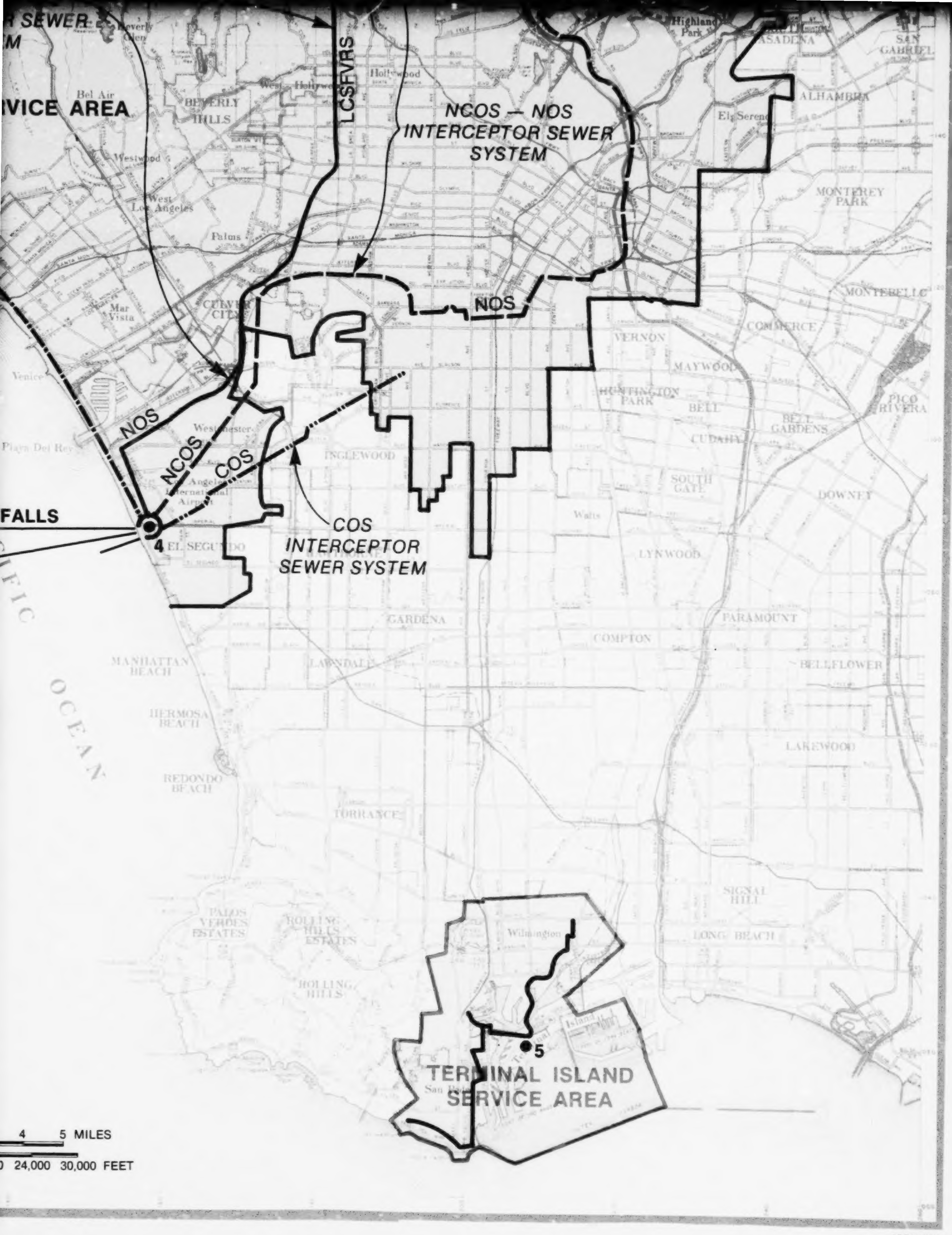
COS INTERCEPTOR SEWER SYSTEM
EVIS
EA
EA
N
S
E
W
MOUNTAINS
Sunland
Tujunga
La Crescenta
La Cañada
Altadena
Van Nuys
Burbank
Glendale
Pasadena
Eagle Rock
Griffith Park
Highland Park
San Marino
South Pasadena
San Gabriel
Alhambra
El Sereno
Hollywood
West Hollywood
Beverly Hills
Beverly Glen
Westwood
West Los Angeles
Palms
Culver City
Mar Vista
Westchester
Los Angeles International Airport
El Segundo
Inglewood
Watts
Lynwood
South Gate
Cudahy
Bell
Bell Gardens
Huntington Park
Maywood
Vernon
Commerce
Monterey Park
Montebello
Pico Rivera
Downey


R SEWER
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LCSFVRS
NCOS — NOS INTERCEPTOR SEWER SYSTEM
NOS
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NCOS
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FALLS
4
COS INTERCEPTOR SEWER SYSTEM
5
TERMINAL ISLAND SERVICE AREA
4
5 MILES
24,000
30,000 FEET
Beverly Glen
Bel Air
Beverly Hills
Westwood
West Los Angeles
Palms
Hollywood
West Hollywood
Highland Park
Pasadena
San Gabriel
Alhambra
El Sereno
Monterey Park
Montebello
Commerce
Vernon
Maywood
Huntington Park
Bell
Cudahy
Bell Gardens
Pico Rivera
Downey
South Gate
Watts
Lynwood
Paramount
Compton
Bellflower
Lakewood
Culver City
Mar Vista
Venice
Playa Del Rey
Westchester
Los Angeles International Airport
Inglewood
El Segundo
Gardena
Lawndale
Manhattan Beach
Hermosa Beach
Redondo Beach
Torrance
Palos Verdes Estates
Rolling Hills Estates
Rolling Hills
Wilmington
San Pedro
Terminal Island
Signal Hill
Long Beach
Pacific Ocean

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each treatment

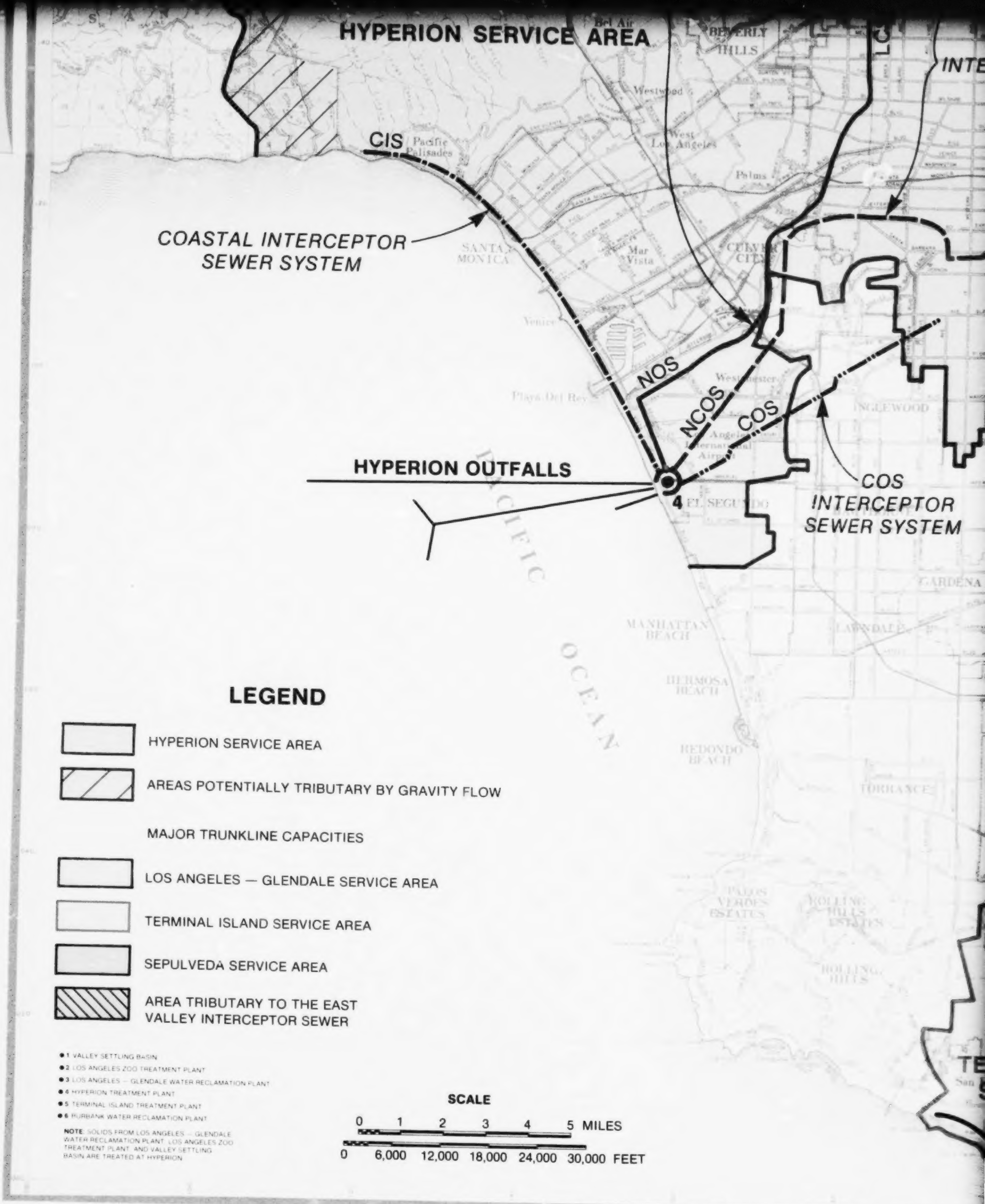
HYPERION SERVICE AREA
Bel Air
BEVERLY HILLS
INTE
Westwood
CIS
Pacific Palisades
West Los Angeles
Palms
COASTAL INTERCEPTOR SEWER SYSTEM
SANTA MONICA
Mar Vista
CULVER CITY
Venice
NOS
NCOS
COS
Westchester
Playa Del Rey
Los Angeles International Airport
INGLEWOOD
HYPERION OUTFALLS
4
EL SEGUNDO
COS INTERCEPTOR SEWER SYSTEM
PACIFIC OCEAN
GARDENA
MANHATTAN BEACH
LAWNDALE
HERMOSA BEACH
REDONDO BEACH
TORRANCE
PALOS VERDES ESTATES
ROLLING HILLS ESTATES
ROLLING HILLS
TE
LEGEND
HYPERION SERVICE AREA
AREAS POTENTIALLY TRIBUTARY BY GRAVITY FLOW
MAJOR TRUNKLINE CAPACITIES
LOS ANGELES — GLENDALE SERVICE AREA
TERMINAL ISLAND SERVICE AREA
SEPULVEDA SERVICE AREA
AREA TRIBUTARY TO THE EAST VALLEY INTERCEPTOR SEWER
● 1 VALLEY SETTLING BASIN
● 2 LOS ANGELES ZOO TREATMENT PLANT
● 3 LOS ANGELES — GLENDALE WATER RECLAMATION PLANT
● 4 HYPERION TREATMENT PLANT
● 5 TERMINAL ISLAND TREATMENT PLANT
● 6 BURBANK WATER RECLAMATION PLANT
NOTE: SOLIDS FROM LOS ANGELES — GLENDALE WATER RECLAMATION PLANT, LOS ANGELES ZOO TREATMENT PLANT, AND VALLEY SETTLING BASIN ARE TREATED AT HYPERION
SCALE
0 1 2 3 4 5 MILES
0 6,000 12,000 18,000 24,000 30,000 FEET

Figure VII-7. The proposed service areas for each treatment facility in Alternative B4C.

Table VII-10. Costs for major elements of Alternative B4C (in 1975 dollars).

PROJECT ELEMENT	CONSTRUCTION COST	OPERATION COST	TOTAL COST
HTP Secondary Conversion (307 mgd)	171,282,000	371,582,000	542,864,000
HTP Interim Sludge Processing & Disposal	14,007,000	Included Above	14,007,000
Sepulveda Water Reclamation Plant (40 mgd)	38,356,000	44,968,000	83,324,000
Sepulveda Plant 30 mgd Addition	21,503,000	22,580,000	44,083,000
Sepulveda Plant 15 mgd Addition	11,569,000	3,948,000	15,517,000
East Valley Interceptor Sewer			
EVIS I	7,731,000	588,000	8,319,000
EVIS II	4,604,000	289,000	4,893,000
LA-Glendale 10 mgd Addition	5,937,000	4,956,000	10,893,000
Griffith Park R.W.D.S. (9 mgd)	819,000	2,218,000	3,037,000
Sepulveda Dam Recreation Area R.W.D.S. (9 mgd)	758,000	1,432,000	2,190,000
TOTAL	276,566,000	452,561,000	729,127,000

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Operation of the primary treatment system will be essentially similar to that of the existing primary system with two exceptions. Screenings from the West Headworks will be collected and landfilled, rather than being ground and returned to the influent, thus reducing the load on the primary treatment process. An additional bank of four automatically cleaned rectangular sedimentation tanks will be added to the battery of primary tanks fed by the East Headworks.

The activated sludge process will still be used; however, the aeration process will occur in four modules of four tanks each (16 in all). Each tank will be covered and sealed, fitted with interior baffle walls to provide five stages of oxygenation, and supplied with 98 percent pure oxygen in place of air. A proprietary (UNOX) process developed by the Union Carbide Corporation probably will be used.

Mixed liquor from the aeration tanks will be settled in four banks of 24 final sedimentation tanks, for a total of 96. These tanks will also be rectangular and automatically cleaned, and all will be new.

The secondary effluent will be chlorinated prior to discharge only if the 1-mile outfall is used as during maintenance clearing of the pipe or emergency situations. All sludge will be digested in high-rate anaerobic digestors.

Scrubbing equipment is also to be installed to remove odor-causing substances from discharged air as necessary.

Interim sludge processing using dewatering by centrifuation and landfill disposal of the sludge cake is planned. Fifteen solid-bowl centrifuges would be required, and polymers would be added to the sludge prior to processing to maximize solids capture. Approximately 90 percent of the digested solids would be captured, with the remainder remaining in the centrate. This facility would be installed at the HTP site.

The new HTP facilities will produce approximately 16 mgd of reclaimed water (screened secondary effluent) for such internal uses as engine oil cooling, foam spray, and compressor cooling.

Predicted effluent quality, assuming implementation of all practicable source controls for mercury, cyanide, and nickel, can meet all requirements of the National Pollution Discharge Elimination System (NPDES) permit for the plant, except for total chromium. The permit standards set daily maximums of 0.01 mg/l, and 30-day averages of 0.005 mg/l. Even with application of best practicable source control, the effluent concentration (resulting from uncontrollable domestic sources) is expected to be in the range of 0.006 to 0.007 mg/l, or 20 to 40 percent in excess of the specified 30-day average. In order to meet the standards for mercury, additional source controls, probably on hospitals, may have to be promulgated and enforced.

(1) CONSTRUCTION ACTIVITIES (DPW, 1975a and 1976). Construction will take place over a period of three to four years, beginning in 1977. Major construction activities include:

Excavation of 1,000,000 cubic yards of sand.

Creation of 772,000 square feet of flat land area.

Construction of 16 biological reactors.

Construction of 4 primary sedimentation tanks.

Conversion of 12 of the existing digester tanks to high rate digestors.

Construction of a 2,980 foot long effluent conduit.

Construction of a 24,000 pound/day chlorination facility.

Construction of an effluent eductor.

Construction of 2 sludge blender tanks.

Construction of 4 floatation thickeners.

Installation of a 400 ton per day gaseous oxygen production plant.

Installation of 4 foul air scrubbing towers. (preliminary estimate)

Installation of electrical power generators. (capacity and quantity unknown)

Restoration of the existing primary sedimentation tanks.

Renovation of the existing Headworks buildings.

The following existing facilities will be demolished for the construction of new facilities:

Final sedimentation tanks

Aeration tanks

Figure VII-8 shows the planned period of construction for each of the 16 construction projects and shows the type of effluent discharge to be expected during the total period of construction. Chapter VIII discusses effluent quality and impacts.

Figures VII-9 to VII-11 show the proposed plant construction phases, and Figure VII-12 shows a schematic flow diagram of the proposed unit processes. Following is a discussion of each project involved in this total conversion. It is proposed that construction will commence in 1977, and that facilities will be operational by the end of 1981. Approximately 2,994 manyears of labor will be required for the construction of 307 mgd secondary treatment facilities at HTP. Another 245 manyears will be required for construction of the sludge processing facilities.

(a) Headworks and Primary Tanks. The existing plant consists of three primary sedimentation tank modules. A fourth module of four primary

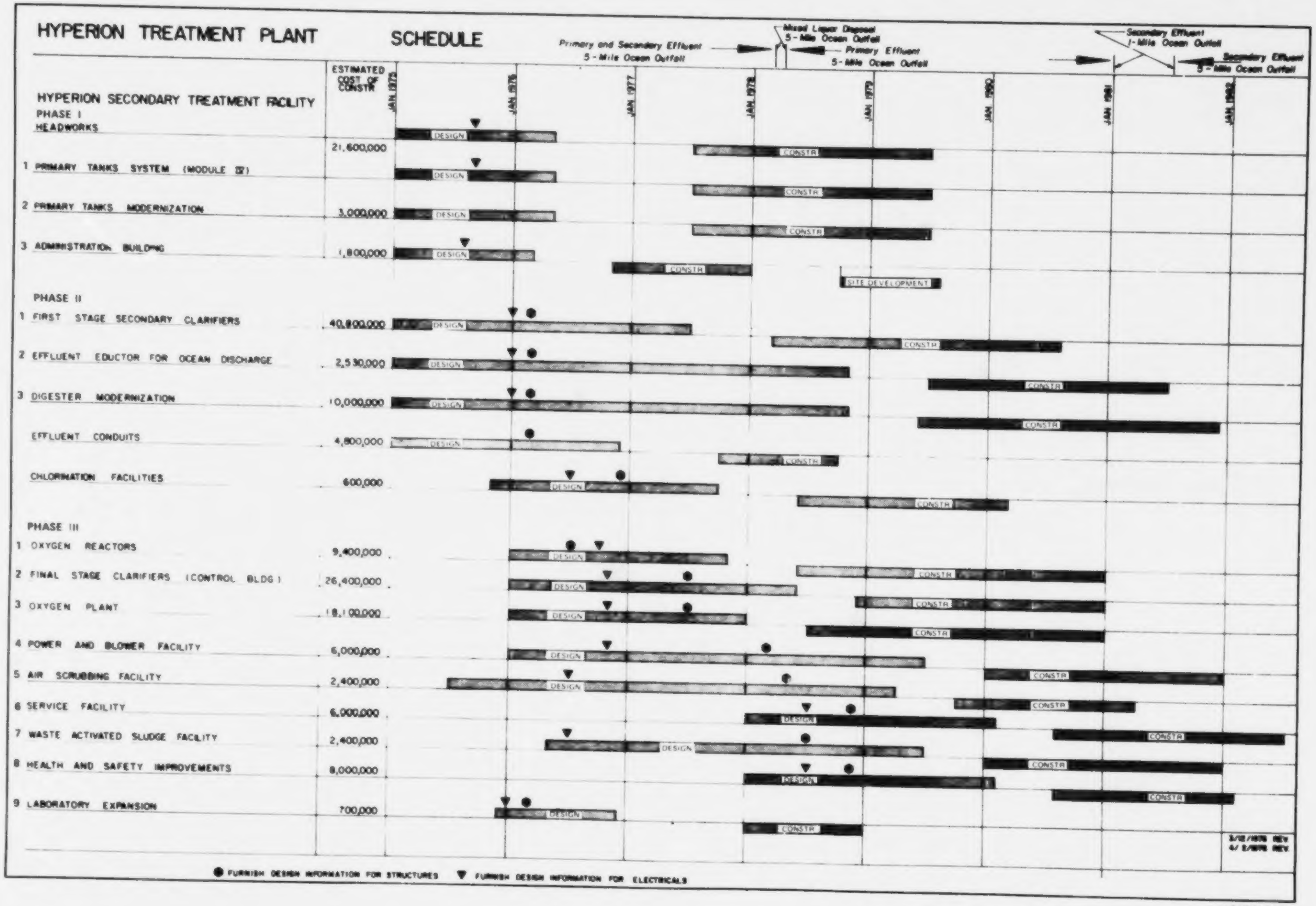

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Figure VII-8. Proposed plant construction phases.

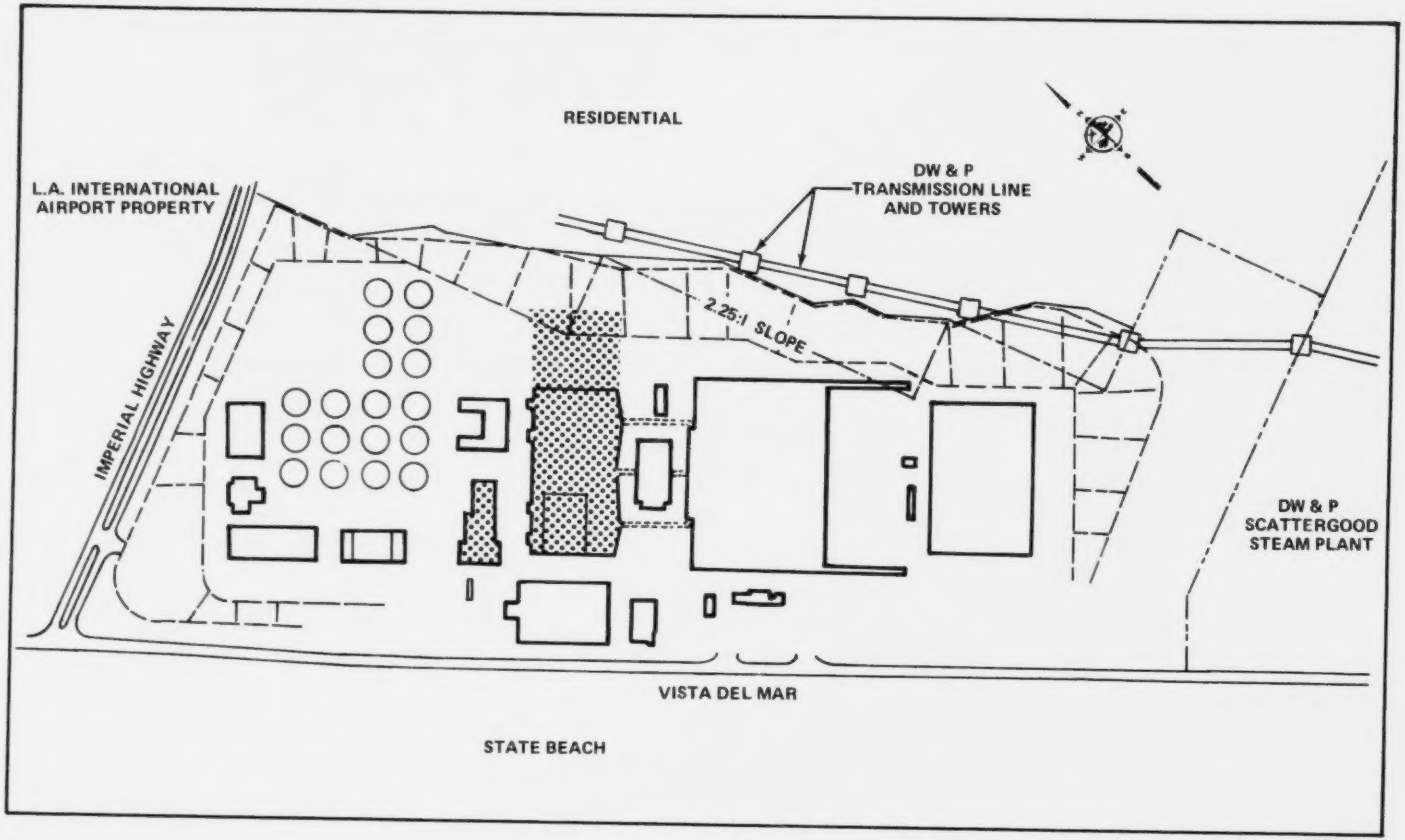
RESIDENTIAL
L.A. INTERNATIONAL AIRPORT PROPERTY
DW & P TRANSMISSION LINE AND TOWERS
2.25:1 SLOPE
IMPERIAL HIGHWAY
DW & P SCATTERGOOD STEAM PLANT
VISTA DEL MAR
STATE BEACH

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Figure VII-9. Phase I—construction, Hyperion Secondary Treatment Facility.

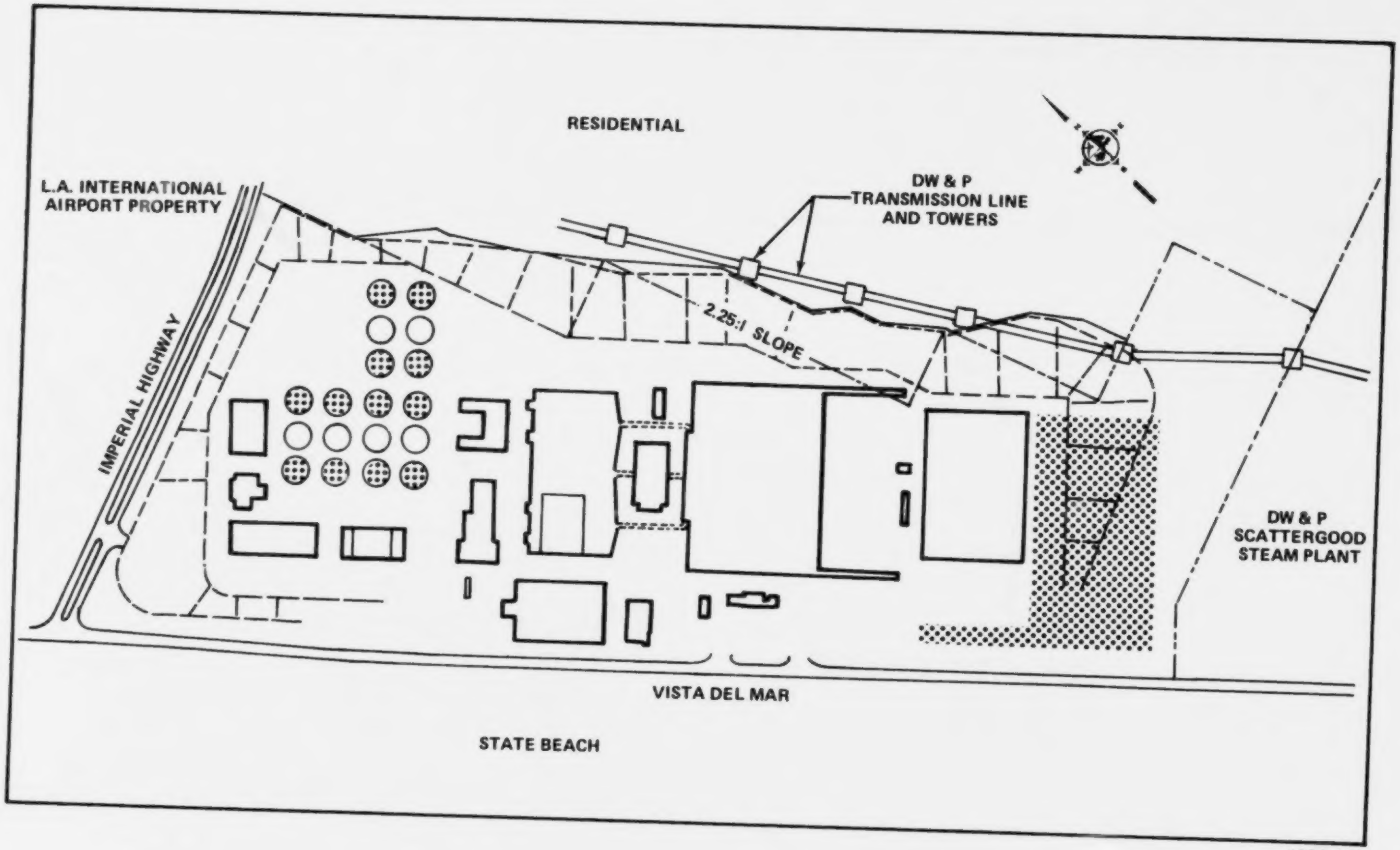
RESIDENTIAL
L.A. INTERNATIONAL AIRPORT PROPERTY
DW & P TRANSMISSION LINE AND TOWERS
2.25:1 SLOPE
IMPERIAL HIGHWAY
DW & P SCATTERGOOD STEAM PLANT
VISTA DEL MAR
STATE BEACH
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Figure VII-10. Phase II—construction, Hyperion Secondary Treatment Facility.

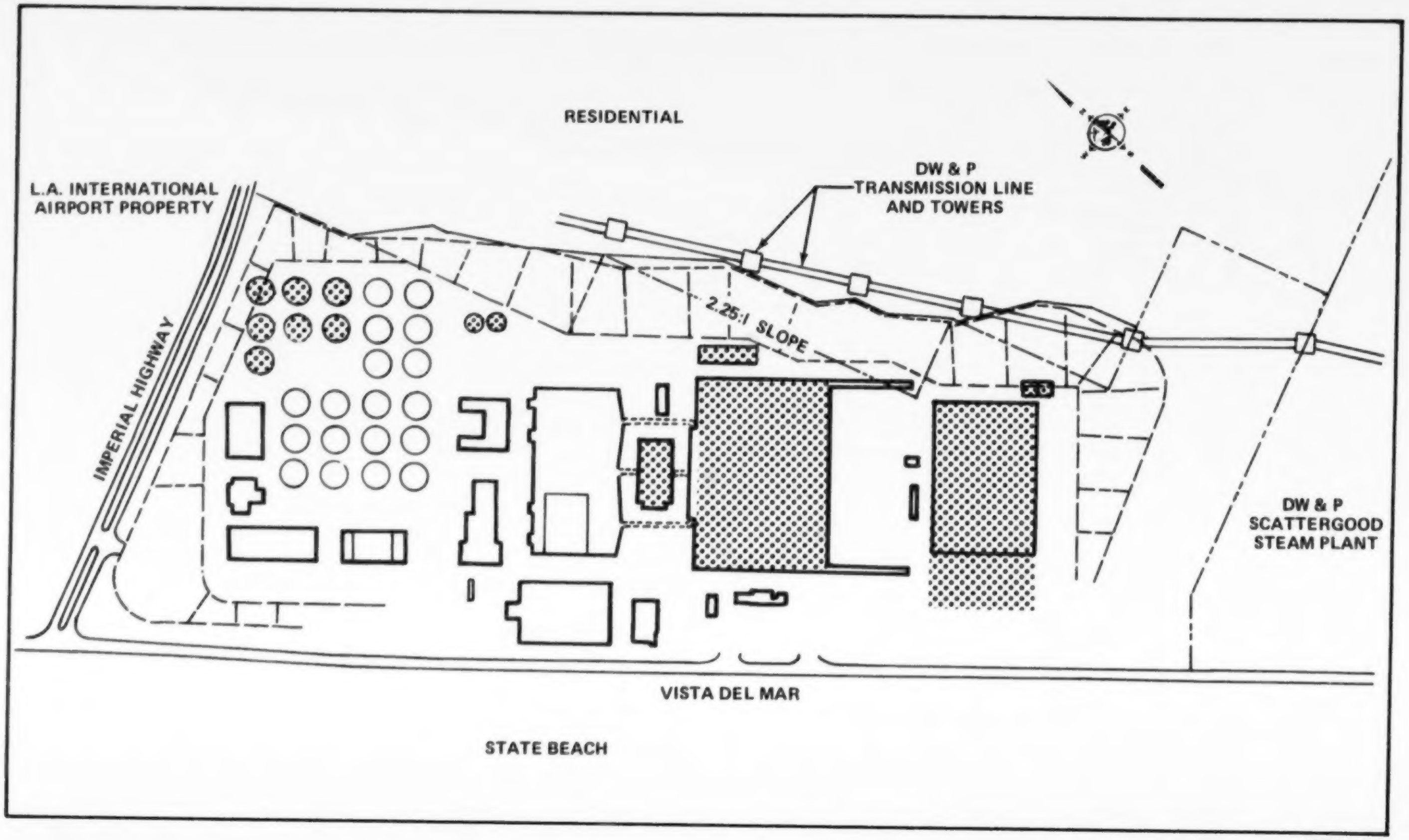
RESIDENTIAL
L.A. INTERNATIONAL AIRPORT PROPERTY
DW & P TRANSMISSION LINE AND TOWERS
IMPERIAL HIGHWAY
2.25:1 SLOPE
DW & P SCATTERGOOD STEAM PLANT
VISTA DEL MAR
STATE BEACH
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Figure VII-11. Phase III—construction, Hyperion Secondary Treatment Facility.

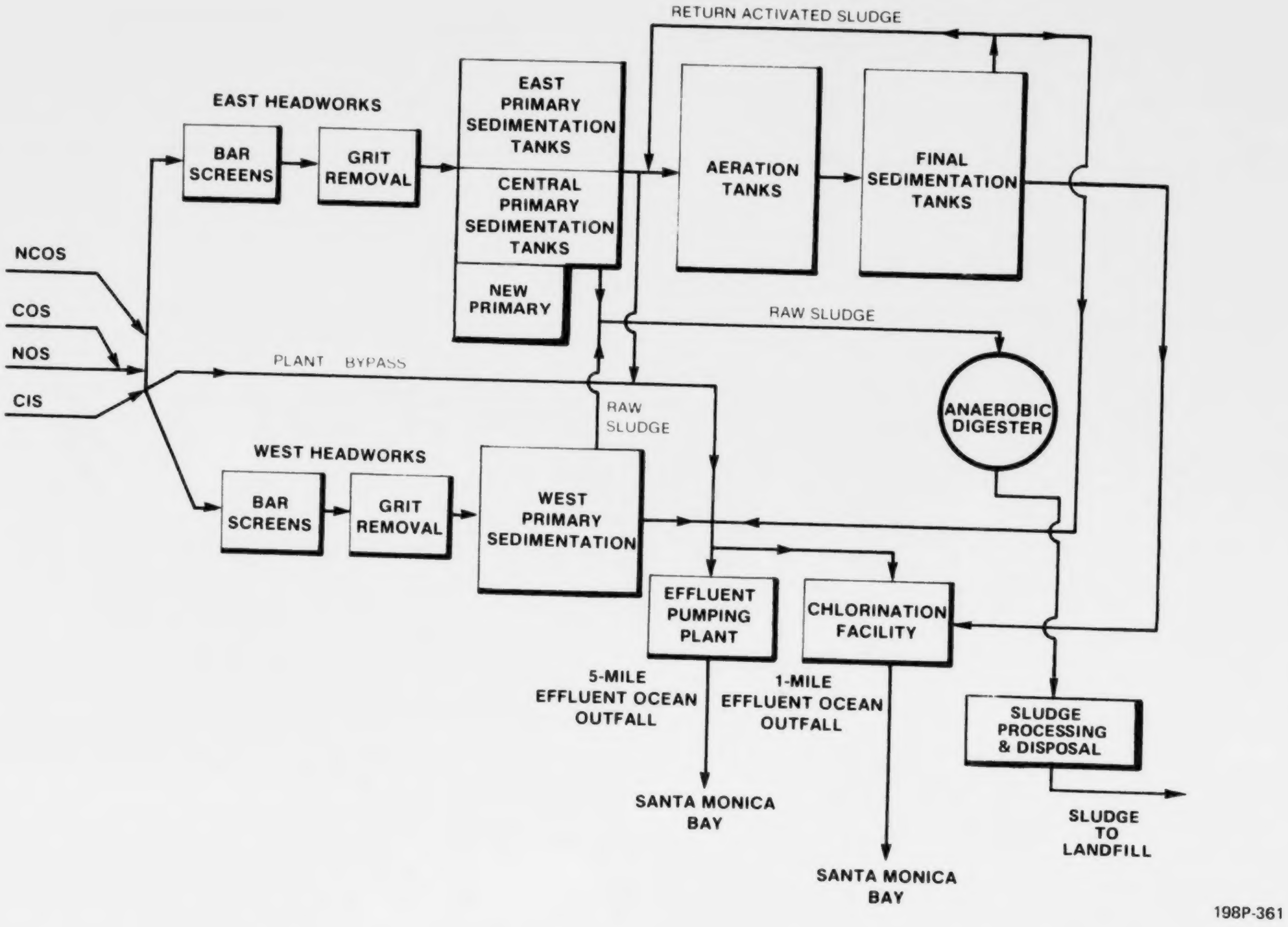
RETURN ACTIVATED SLUDGE
EAST HEADWORKS
BAR SCREENS
GRIT REMOVAL
EAST PRIMARY SEDIMENTATION TANKS
CENTRAL PRIMARY SEDIMENTATION TANKS
NEW PRIMARY
AERATION TANKS
FINAL SEDIMENTATION TANKS
NCOS
COS
NOS
CIS
PLANT BYPASS
RAW SLUDGE
RAW SLUDGE
ANAEROBIC DIGESTER
WEST HEADWORKS
BAR SCREENS
GRIT REMOVAL
WEST PRIMARY SEDIMENTATION
EFFLUENT PUMPING PLANT
CHLORINATION FACILITY
5-MILE EFFLUENT OCEAN OUTFALL
1-MILE EFFLUENT OCEAN OUTFALL
SLUDGE PROCESSING & DISPOSAL
SANTA MONICA BAY
SANTA MONICA BAY
SLUDGE TO LANDFILL
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Figure VII-12. Flow diagram of HTP with full secondary treatment.

sedimentation tanks would be constructed. Each tank would be 300 feet long with three bays, each 56.5 feet wide, and have a depth of 15 feet. The tanks would have a flow rate of 22 mgd, with an overflow rate of 1,300 gpd/sq ft and a detention time of 2.08 hours. At a daily peak flow of approximately 460 mgd, each tank will have a flow rate of 30.7 mgd, an overflow rate of 1,800 gpd/sq ft, and a detention time of 1.48 hours.

The sludge collection mechanism for each tank would consist of chain-driven scraper flights, three sets in each tank. The sludge scraper flights would be spaced 10 feet apart on a pair of endless chains. Surface-mounted drive motors would pull the flight and chain assembly along the tank bottom, carrying the settled solids to the influent end of each tank, from where the solids would be pumped to the sludge digestion tanks.

Primary sludge pumping units would be added to handle the sludge produced by the new primary module. The pumps would be arranged in two batteries of three pumps each and located in the pipe gallery below the influent channel to the primary tanks. The pumps would be torque-flow centrifugal units which are able to handle coarse primary sludge without plugging.

The East Headworks facility would be modified by installation of a pumping system to transport the bar screenings to a series of storage hoppers for subsequent hauling to a landfill. The screenings are currently ground up and returned to the treatment process for removal in the primary tanks. This material is primarily inorganic, and its removal by the proposed process would allow more space in the digesters for organic material.

(b) Primary Modernization. The central and east primary tank modules have suffered serious deterioration over the years because the concrete surfaces are not protected. The modules would be reconstructed and all concrete surfaces exposed to sewage would be given a protective coating of polyvinyl chloride. This should extend the service life of these primary tanks to that of the proposed new primary module.

(c) Administration Building. Because of the more advanced treatment proposed at the HTP, plant staffing is expected to increase during the planning period. To provide space for these additional personnel and to maintain high efficiency in plant operations, a new administration building would be constructed to provide space for the necessary engineering, administrative, supervisory, and public relations personnel.

The vacated space in the existing administration building would be used to expand the laboratory and house the laboratory staff and additional equipment. This additional space is necessary so that the laboratory staff will be able to conduct the increased number of tests that will be required to monitor the various plant processes and effluent quality.

(d) First Stage Secondary Clarifiers. To provide capacity for full secondary treatment at the HTP, new secondary sedimentation tanks (clarifiers) would have to be constructed. The secondary clarifiers would be constructed in two stages. The first stage construction would consist of the final grading of areas for the first and final stage secondary clarifiers, the control building, and chlorination facilities. Also included would be the construction of 48 secondary clarifiers in two modules and all appurtenances, including the sludge removal mechanisms and the construction of influent and effluent channels, galleries, and the return activated sludge system. Finally, the construction of service roads and storm drain systems adjacent to the clarifiers would be included.

(e) Effluent Eductor. This proposed project consists of installing an eductor (jet pump) in line with the existing effluent pump system. This installation would be located westerly of the existing effluent pumping plant paralleling the existing 144-inch diameter 5-mile outfall.

The extent of the work in this project includes the model testing, fabrication, and installation of the eductor. In addition, the following components would be furnished and installed:

- Ten-foot diameter suction line.
- Eight-foot diameter drive line.
- Connection to existing 144-inch outfall.
- Valve structure and appurtenances.

A right-of-way of approximately 75 feet wide by 400 feet long in the beach state park is required for this installation.

The effluent eductor will provide two additional feet of hydraulic head through the plant necessary for the operation of the proposed secondary clarifiers. It would also save approximately 1.5 million kw-hr of electrical energy per year through reduced use of the existing effluent pumps. This, in turn, should help reduce the annual maintenance costs for the pumps. Finally, the eductor would add the bypass capacity required during the construction of the connecting channels to the effluent pumping wet well and for bypass of the effluent pumping plant for maintenance purposes in the future.

(f) Digester Modernization. This project consists of the design and construction for the conversion of the remaining 12 of 18 anaerobic digesters to high rate digesters.

Incidental work would include providing sludge pumping for feeding and circulation of the digesters, providing heating for the digesters, and providing gas recirculation mixing. Existing piping and pumping facilities would have to be remodeled. The structural adequacy of the digesters will require investigation, and necessary improvements would be made.

The digester modernization will partially take care of the stabilization and digestion of secondary and primary sludges. Additional secondary sludge will be produced by the conversion from partial to full secondary treatment.

(g) Effluent Conduits. Following secondary treatment, plant effluent would be carried from the 4-module secondary settling tanks to the existing effluent pump wet well and proposed jet pump by means of conduits. The upstream portion would serve as a collection conduit and be located south of the proposed secondary treatment expansion. The downstream 2,250 feet of conduit would consist of a double reinforced concrete box section and be constructed west of the proposed expansion.

A special structure would be constructed to allow diversion of secondary effluent to the existing 1-mile outfall in the event of a major storm causing excess flows or other plant difficulty.

Bypass structures adjacent to the existing effluent pumping plant are to be constructed to facilitate interconnection of the proposed effluent conduit with the existing wet well.

(h) Chlorination Facilities. The chlorination facility would include a chlorine storage facility, chlorine offloading facilities, chlorine trailers, a chlorination station, and two points of chlorine application.

The chlorine storage facility is planned to provide 7 days of chlorination with a 3-day backup capability (10 days of chlorination from full to empty tank). Two 17-ton chlorine trailers would be a part of the chlorination system to provide an average of 2 chlorine deliveries per week. Air padding facilities would be provided to minimize chlorine handling time during truck offloading.

The chlorination station would be equipped with chlorine evaporators and chlorinators fully capable of providing chlorination to all flows that would be processed at the treatment plant.

Facilities for chlorine application would be provided at the end of the secondary clarification tanks, and chlorine application is proposed only when the 1-mile effluent outfall must be used to discharge excessive flows resulting from heavy rainstorms, or during other plant unit breakdowns to ensure adequate disinfection. This proposal has not yet received final evaluation and approval. If necessary, the chlorine facilities could operate continuously for disinfection of effluents discharged out the 5-mile outfall. The effluent conduit from the secondary clarifiers to the effluent pump plant would serve as a "control chlorine contact chamber" (10 to 15 minutes detention) by which chlorine residuals would be monitored and controlled.

The use of ozone for disinfection purposes has also been investigated. However, ozonation has been determined by the City to be less feasible and cost-effective than chlorination.

(i) Oxygen Reactors. Sixteen oxygen reactor tanks would be arranged to form four independently operating modules of 4 tanks per module. The existing aeration tanks have sufficient volume for conversion to oxygen reactors; therefore, additional tanks would not be required. However, a study is underway to determine whether the existing tanks can be separated into four modules and sealed to provide a gas tight condition. Loss of oxygen by leakage may preclude the use of the existing tanks, and new tankage may be more economically feasible.

If the existing tanks are converted to oxygen use, each tank will be covered after baffle walls have been constructed to separate each tank into five stages. Each stage would have one surface aerator sized to meet the oxygen dissolution and mixing requirements of that stage. Overall tank dimensions would be 60 feet wide by 300 feet long by 20 feet deep. Water depth in the tanks would be 15 feet with a 5-foot space above the water surface for oxygen dissolution by the surface aerators.

New tankage would be arranged into four modules essentially within the same area as occupied by the existing aeration tanks. The tank dimensions would have to be determined.

(j) Final Stage Secondary Clarifiers, Control Building and Effluent Service Facilities. The final stage secondary clarifier construction would require the complete demolition and removal of all of the existing secondary clarifiers and their appurtenances. The remaining 48 secondary clarifiers would be constructed in two modules, together with appurtenances, to form a complete four modular system. Also involved would be the completion of the channels, galleries and return activated sludge system for the first stage clarifiers, and the construction of influent and effluent channels, galleries, return activated sludge system, storm drains, and service roads adjacent to the final stage clarifiers. Finally, included would be the construction of a control building for the secondary clarifiers and the effluent service facilities with wash water screening and pumping plant. The pumping plant would provide high and low pressure effluent for normal maintenance of the aeration tanks, primary and secondary clarifiers, foam control, and lawn and plant spray .

(k) Oxygen Supply Alternatives. A supply of gaseous high purity oxygen would be required for secondary treatment at the HTP. Average oxygen consumption would be in the neighborhood of 320 tpd (tons per day). The anticipated peak oxygen demand rate will range from 375 tpd to 400 tpd. Reliability will be a critical requirement of any oxygen supply to be used.

There are primarily two oxygen supply options available. The City could purchase oxygen production equipment to provide an "in-house" oxygen supply capability, or oxygen may be purchased from a commercial oxygen producer and brought in to the HTP by pipeline. Numerous supply alternatives are possible from variations of the two options. Alternatives are discussed in the Facilities Plan but there would be little difference between the envirnonmental impacts of the two basic methods.

(l) Power and Blower Building Modernization. The full expansion of the secondary treatment at the HTP will require additional electrical power and will affect the blower requirements. Both of these factors will govern the ultimate modernization of the Power and Blower Building.

With the addition of new primary tanks and the sludge digester improvements, digester gas production is expected to increase. The magnitude of increase will be such that all power needs of the expanded plant, except that required for the oxygen supply and effluent pumps, could be supplied by the onsite power generating facility.

There will be a surplus of blower capacity in the Power and Blower Building. If pure oxygen is to be used to implement the full expansion of the secondary treatment, the blowers would no longer be needed except for the channel aeration. Whether or not the area, which is currently occupied by the surplus-to-be blowers, could be made available for the power facility expansion has not been determined. There remains a question as to the need for a new and separate power facility in addition to modernizing the existing Power and Blower Building.

(m) Air Scrubbing Facilities. The Southern California Air Pollution Control District has set 150 odor units as the allowable limit for odors. At Hyperion, the outfall ventilation has about 4,000 odor units.

The control of sewage gases in the outfall sewers and in treatment works is also necessary to retard or to prevent deterioration of the structures and equipment.

Foul air treatment at the HTP would be accomplished by an independent air scrubbing facility. The selection of the pure oxygen process for the implementation of full secondary treatment could eliminate the option to use the plant foul air in the aeration of activated sludge. The independent facility could be of pack tower type.

The air scrubbing facility would be capable of operating in four different modes depending on the nature of the odor and the degree of treatment required. The four modes of operation would include:

- Dry treatment (mixing foul air with ambient air).
- Wet treatment (using chlorinated secondary effluent).
- Biological treatment (using unchlorinated secondary effluent).
- Chemical treatment (using selected chemicals mixed with secondary effluent).

A series of packed towers could be located at a suitable location to consolidate all plant air for centralized unit treatment; or, a number of smaller towers could be installed at strategic locations throughout the plant where the need of individual treatments is evident. The choice of the location will be made after a study determines the foul air source locations, characteristics, and quantities.

(n) Digesters and Waste Activated Sludge Treatment Facilities. This project would consist of design and construction for the addition of four new egg-shape type digesters, three new waste activated sludge flotation thickeners, two new blending tanks and incidental piping, pumps, mechanisms, walkways, and towers.

The additional digesters would totally accommodate the digestion and stabilization of the increased secondary sludge produced by the conversion to full secondary treatment, together with the sludge produced by the inland treatment plants. Flotation thickeners would be required for thickening of secondary sludge. The blending tanks would be used for blending of the primary sludge with the secondary sludge. Use of the blending tank, which also serves as sludge storage, would allow for more uniform feeding of the raw sludge into the digesters.

(o) Interim Sludge Processing and Disposal System. Due to the time constraint established for eliminating sludge discharge to the ocean, the apparent best alternative project for an interim sludge processing and disposal system for the HTP is dewatering the digested sludge by centrifugation and hauling the sludge cake by truck to a sanitary landfill for final disposal.

The primary sedimentation sludge and the waste activated sludge would be combined, digested in the anaerobic digesters, and dewatered by centrifugation. Centrate would be evaporated by the Carver-Greenfield Process and the resultant solids would also be landfilled. The first phase of the sludge disposal program (August 1978 - March 1980) will treat only 25 percent of the sludge. Beginning in April, 1980, 100 percent of sludge will be processed.

Dewatering by centrifugation for all sludge produced at HTP will require 15 solid bowl centrifuges that would operate at a rate of about 110 gpm, and, with the aid of polymers, would capture about 90 percent of the digested sludge solids.

All of the sludge cake and solids from evaporated centrate would be trucked to a sanitary landfill. It is estimated that an average of 800 tons of sludge per day, with a solids content of 25 percent, would be hauled to a landfill while the interim project is operational. At a currently undetermined landfill site, the sludge cake will be combined with refuse and buried. Sludge processing and impacts are being considered in a separate study.

(p) Service Facilities. The architectural objective for the master plan of the Hyperion Treatment Plant is to develop a total concept that will establish both continuity and compatibility between the new and existing facilities. In order to achieve this, consideration is given to the functional adequacies of each service facility.

It is proposed that the following be included to eliminate existing functional inadequacies at the HTP:

- The Digester System Battery Control Buildings should be modernized to provide more area for office, storage, and lunchroom facilities, and to upgrade existing restroom and shower room facilities.
- The Service Building should be improved in one of the three following ways; build a new larger facility at a suitable location, such as the land now occupied by the 60-day Fertilizer Storage Building; divide the existing services and build a detached annex service building at a suitable location and improve the existing service building to more adequately house the remaining services; or remodel and enlarge the existing service building as much as the surrounding land would permit.
- The East Headworks should be modernized to provide more office space and improved lunchroom and shower room facilities, and also to provide improved storage handling facilities in the basement. The existing chlorine handling areas should be remodeled to provide for efficient usage.
- The West Headworks should be remodeled to provide an office for the control operator.
- The Primary Tanks Control Building should be remodeled to improve laboratory and lunchroom facilities.
- The Power and Blower Building should be remodeled to reduce sound and vibration transmission, increase and improve restroom facilities, increase office area and record storage, add a bridge crane in the shop area, and add a clean room for critical tolerance work.
- The Vehicular Storage Building should be remodeled to separate functional elements of the grounds maintenance crew.
- Grounds maintenance facilities should be improved, including expansion of the existing lath house and the addition of a propagation greenhouse to enhance the plant site landscaping.
- The possible future use of the buildings no longer in service should be evaluated with respect to the sludge management study recommendations.

Service facilities should be incorporated into the design of the proposed Secondary Clarifier Control Building. These facilities would include an operational control room, work shop, lunchroom, restroom, indoor storage room, and outdoor storage facilities.

The service facility provisions for the Chlorination Building will depend on the final location of the proposed Secondary Clarifier Control Building. Unless these buildings are widely separated, no provisions other than emergency services should be anticipated in the Chlorination Building.

Service facilities for the Interim Sludge Processing and Disposal System should include a centrifuge building, sludge storage building, and appurtenance structures. Within the centrifuge building, space should be allocated for maintenance and storage, control room, washroom, locker room, office space, process equipment, and maintenance equipment.

(2) OPERATION (DPW, 1975a and 1976). Upon completion of the full secondary conversion of the Hyperion Treatment Plant and the Interim Sludge Processing and Disposal facilities, plant operation and maintenance procedures will be modified accordingly. Further, staffing of the plant will necessarily be increased primarily with the addition of 40 truck drivers to handle the sludge hauling operations of the sludge disposal facility. In all, it is expected that 68 new personnel will be added to the current treatment plant staff, bringing the total to 318 employees. A total of 7,767 manyears[1] of labor will be required over the life of the project for operation of HTP, including sludge disposal.

As required by the State Water Resources Control Board, a licensed Class V Operator (Engineer) is, and will continue to be, responsible for the operations of the HTP facilities. The plant will continue to be manned and operated seven days per week, 24 hours per day. Each shift is headed by a superintendent of sewage treatment. This work shift arrangement will be continued with the full secondary treatment facility. Table VII-11 gives a list of the job classifications and the number of persons in each for the anticipated work force required to operate and maintain the full secondary treatment facility and the sludge processing and disposal facility.

b. Sepulveda Facility. The service area of the treatment plant and of the associated new East Valley Interceptor Sewer (EVIS) is shown on Figure VII-7. Construction is proposed to begin in 1977, and require 2 to 3 years to complete the first 40 mgd unit. Detailed data on this project is presented in a Final Environmental Report (CLA, 1975) to which the interested reader is referred.

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[1] Manyears for operation of HTP were calculated using Table I-2 in the HTP EIR (DPW, 1976), and are reflected in the impact chapters. Using Table X-7 in the Facilities Plan (DPW, 1975a), the total would be 7,542 manyears.

Table VII-11. Personnel requirements for the Hyperion Treatment Plant (DPW, 1975a).

TITLE	EXISTING PLANT	INCREASE WITH SECONDARY CONVERSION AND SLUDGE PROCESSING
Senior Clerk Stenographer	1	0
Clerk Typist	5	1
Senior Clerk Typist	2	0
Toolroom Keeper	4	0
Storekeeper	1	0
Maintenance Laborer	3	1
Maintenance and Construction Helper	3	1
Sandblast Operator	1	0
Gardener Caretaker	5	1
Senior Gardener	3	0
Park Maintenance Supervisor	1	0
Custodian	5	1
Senior Custodian	1	0
Security Officer	1	0
Building Repairer	1	0
Building Maintenance Supervisor	1	0
Carpenter	1	0
Painter	4	2
Senior Painter	1	0
Pipefitter	4	0
Plumber	1	0
Light Equipment Operator	1	1
Equipment Operator	1	0
Heavy Duty Truck Operator	2	40
Machinist	4	1
Machinist Supervisor	1	0
Mechanical Helper	8	2
Senior Mechanical Repairer II	1	0
Assistant Mechanical Superintendent Sewage Treatment	1	0
Mechanical Superintendent Sewage Treatment	1	0
Mechanical Repair Supervisor II	1	0
Welder	4	1
Instrument Mechanic	3	1
Instrument Worker	1	0
Electrician	8	2
Senior Electrician	1	1
Electrician Supervisor	1	0
Sewage Plant Guide	6	0
Sewage Plant Operator	32	2
Intermediate Sewage Plant Operator	10	2
Senior Sewage Plant Operator	4	0
Senior Boat Operator	1	0
Plant Attendant	29	2
Diesel Plant Operator	19	2
Senior Diesel Plant Operator	6	1
Chief Diesel Plant Operator	1	0
Shift Superintendent Sewage Treatment I	5	0
Shift Superintendent Sewage Treatment II	1	0
Electrical Tester	1	0
Mechanical Engineering Assistant	1	0
Chemist I	4	1
Chemist II	2	0
Chief Chemist I	1	0
Chief Chemist II	1	0
Laboratory Director Sewage Treatment	1	0
Laboratory Assistant	8	1
Laboratory Technician	5	1
Water Biologist I	6	0
Water Biologist II	1	0
Sanitary Engineering Assistant	1	0
Sanitary Engineering Associate	5	0
Senior Sanitary Engineer	2	0
Principal Sanitary Engineer	1	0
Administrative Assistant	1	0
Senior Administrative Assistant	1	0
Math and Science Trainee	2	0
Student Worker	2	0
Student Engineer	2	0
TOTAL	250	68

The proposed facility would be located on an 88.28 acre site within the Sepulveda Flood Control Basin, in the southern section of the San Fernando Valley, somewhat east of its center. Figure VII-13 shows the site which is leased by the City from the U.S. Corps of Engineers. The site is bounded by and visible from the San Diego Freeway on the east; a NIKE Military Installation, the Southern Pacific Railroad, and Victory Boulevard on the north; and by the Woodley Avenue Extension and park-grounds on the west and south. The area is used for croplands, recreation, and military activities.

The initial 40 mgd facility is to be constructed in the east central area of the site, isolated from Woodley Avenue by an extensive landscaping project called the "Japanese Gardens." Ample space remains to the east for subsequent expansion. Influent wastewater (40 mgd) would be drawn from the existing Additional Valley Outfall Relief Sewer (AVORS), which traverses the plant site, and the proposed East Valley Interceptor Sewer, EVIS I and II. Sludge and filter backwash would be returned to AVORS, for ultimate processing at Hyperion. Tertiary treated water will be used for internal plant fire protection, and for irrigation of the Japanese Gardens and adjacent park areas.

Figure VII-14 is a simplified flow diagram of the Sepulveda Facility. Modular construction with rectangular tanks is used throughout for effective use of space and good operating efficiency.

Wastewater drawn into the plant is first screened, with comminutors used to reduce the size of larger influent particles. The influent is then pumped to a bank of nine automatically cleaned primary sedimentation tanks, each 200 feet long, 20 feet wide, and with an average water depth of 12 feet. Sludge and floatables are returned to the AVORS; effluent wastewater flows to the aeration tanks of the activated-sludge secondary treatment system.

The aeration system consists of a bank of nine tanks, each 300 feet long, 32 feet wide, and with an average depth of 16 feet. Mixed liquor from the aeration tanks flows, in turn, to 24 final sedimentation tanks, each 150 feet long, 20 feet wide, and with an average depth of 12 feet.

Sludge from the final sedimentation tanks is discharged to the AVORS, and secondary-treated effluent is filtered through six rapid-sand filters, each 110 feet long, 16 feet wide, and with a bed depth of 3 feet. Filtration removes a substantial proportion of the particulate matter, making the filtered wastewater susceptible to effective disinfection by chlorination. Material removed by periodic filter backwashing is discharged to AVORS.

The filtered water is chlorinated for a detention time of 2 hours, at a dosage rate of 2 to 5 mg/l.

The plant is intended to operate at a constant throughput of 40 mgd, but is designed to provide satisfactory treatment for a design peak dry weather flow of 71.5 mgd.

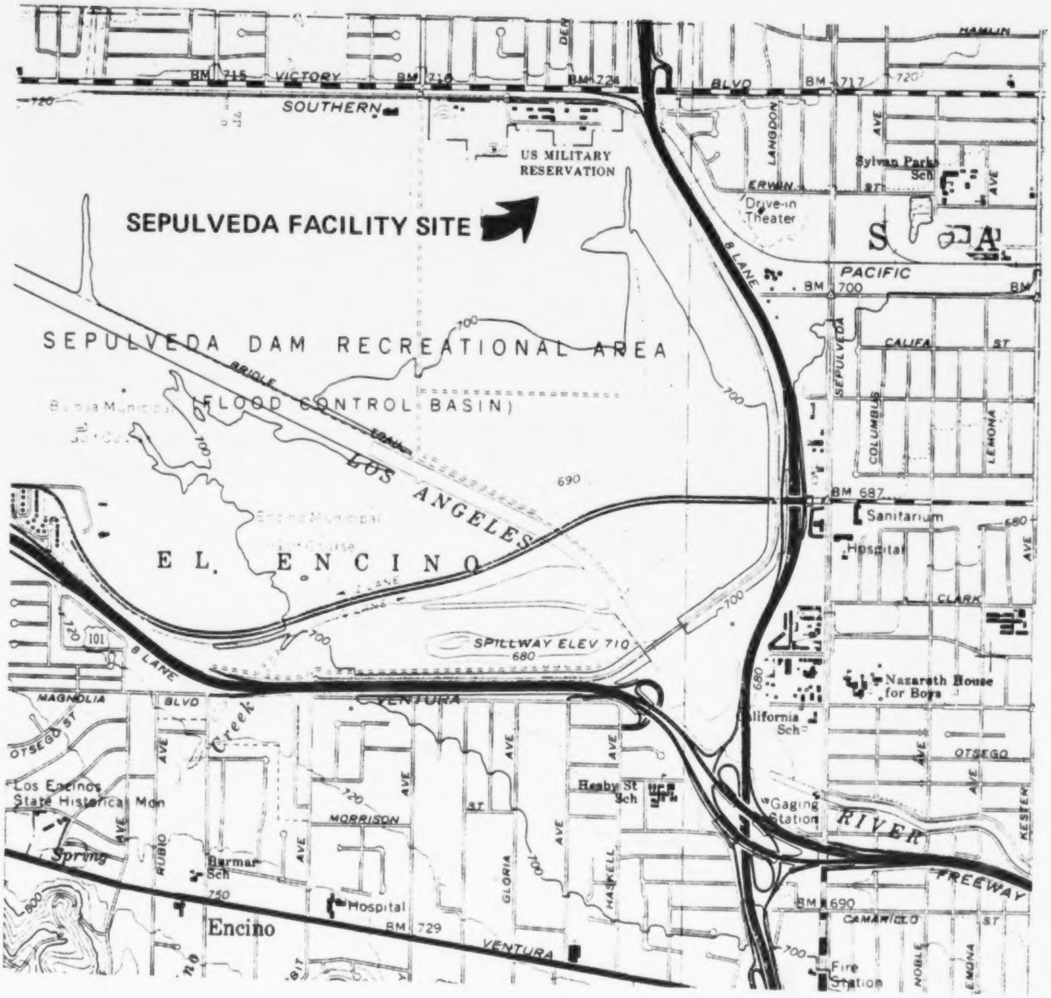
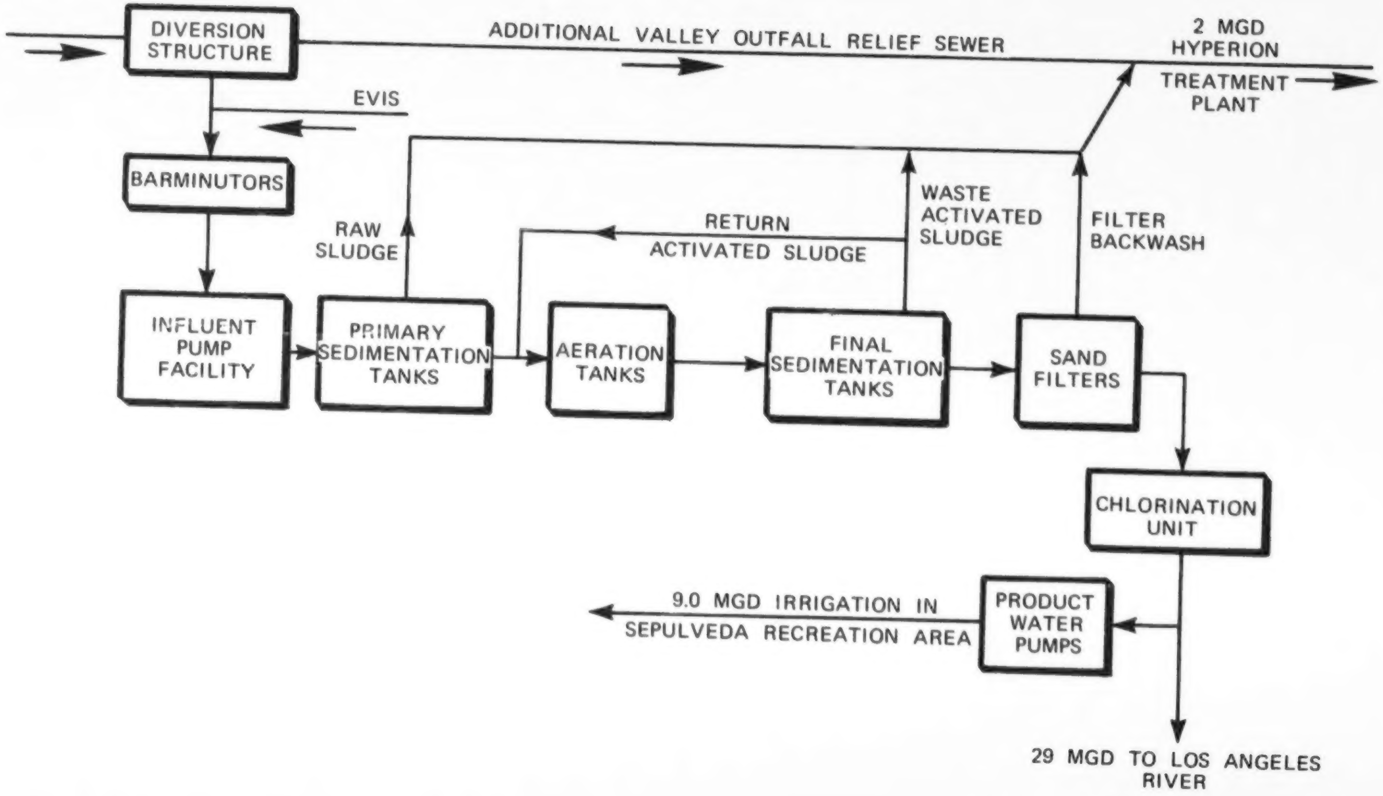

SEPULVEDA FACILITY SITE
US MILITARY RESERVATION
VICTORY
BLVD
SOUTHERN
BM 715
BM 716
BM 724
BM 717
720
HAMLIN
LANGDON
AVE
Sylvan Park Sch
ERWIN
ST
Drive-in Theater
8 LANE
PACIFIC
BM 700
SEPULVEDA DAM RECREATIONAL AREA
(FLOOD CONTROL BASIN)
BRIDLE TRAIL
LOS ANGELES
EL ENCINO
700
690
CALIFA
ST
SEPULVEDA
COLUMBUS
LEMONA
BM 687
Sanitarium
Hospital
680
CLARK
SPILLWAY ELEV 710
680
101
8 LANE
VENTURA
MAGNOLIA
BLVD
OTSEGO ST
Creek
Nazareth House for Boys
California Sch
OTSEGO
KESTER
Los Encinos State Historical Mon
Spring
RUBIO
Barmar Sch
MORRISON
720
GLORIA
HASKELL
Haskell St Sch
Gaging Station
RIVER
FREEWAY
BM 690
CAMARILLO
ST
NOBLE
750
Hospital
Encino
BM 729
VENTURA
Fire Station
800
198P-80

Figure VII-13. Topographic map of the proposed Sepulveda Facility site.

198P-362

The Sepulveda Plant site adjacent to the San Diego Freeway.


DIVERSION STRUCTURE
ADDITIONAL VALLEY OUTFALL RELIEF SEWER
2 MGD HYPERION TREATMENT PLANT
EVIS
BARMINUTORS
RAW SLUDGE
RETURN ACTIVATED SLUDGE
WASTE ACTIVATED SLUDGE
FILTER BACKWASH
INFLUENT PUMP FACILITY
PRIMARY SEDIMENTATION TANKS
AERATION TANKS
FINAL SEDIMENTATION TANKS
SAND FILTERS
CHLORINATION UNIT
PRODUCT WATER PUMPS
9.0 MGD IRRIGATION IN SEPULVEDA RECREATION AREA
29 MGD TO LOS ANGELES RIVER

198P-363

Figure VII-14. Simplified flow diagram of the proposed Sepulveda Facility.

Effluent characteristics were estimated in 1975 and again in 1976. Chapter VIII presents expected effluent quality data and discusses impacts. As with Hyperion, chromium appears to be a potentially troublesome constituent, although data on the degree of potential source control that could be expected in the tributary area are not available. Values for arsenic, selenium, and total nitrogen require further analysis.

Failure of the Sepulveda Plant could result in discharge of wastewater not meeting effluent requirements into the Los Angeles River. Standby generators are provided that can operate either on natural gas or diesel fuel in event of a power outage. All process units and support facilities will be fully protected and operational up to 100-year flood conditions, except for the chlorine contact basins and filter units. Under flood conditions, wastewater will be flash chlorinated, with thorough mixing assured through design of the downstream flow channel to give violent, turbulent mixing. Plant influent can also be bypassed to sewers. Construction of the plant will not change the capacity of the flood control basin: a volume of material equal to the displacement of the plant is to be removed.

Alternative B4C also proposes two modular additions to the SWRP to provide for future hydraulic and treatment relief. There would be a 30 mgd addition in 1980 and a 15 mgd addition in 1993. These additions would consist of exactly the same unit processes as the first stage 40 mgd plant, and be constructed in parallel with the 40 mgd plant process units.

Construction of the initial 40 mgd SWRP would require 671 manyears of labor, the 30 mgd addition would require 376 manyears, and the 15 mgd addition would require 202 manyears.

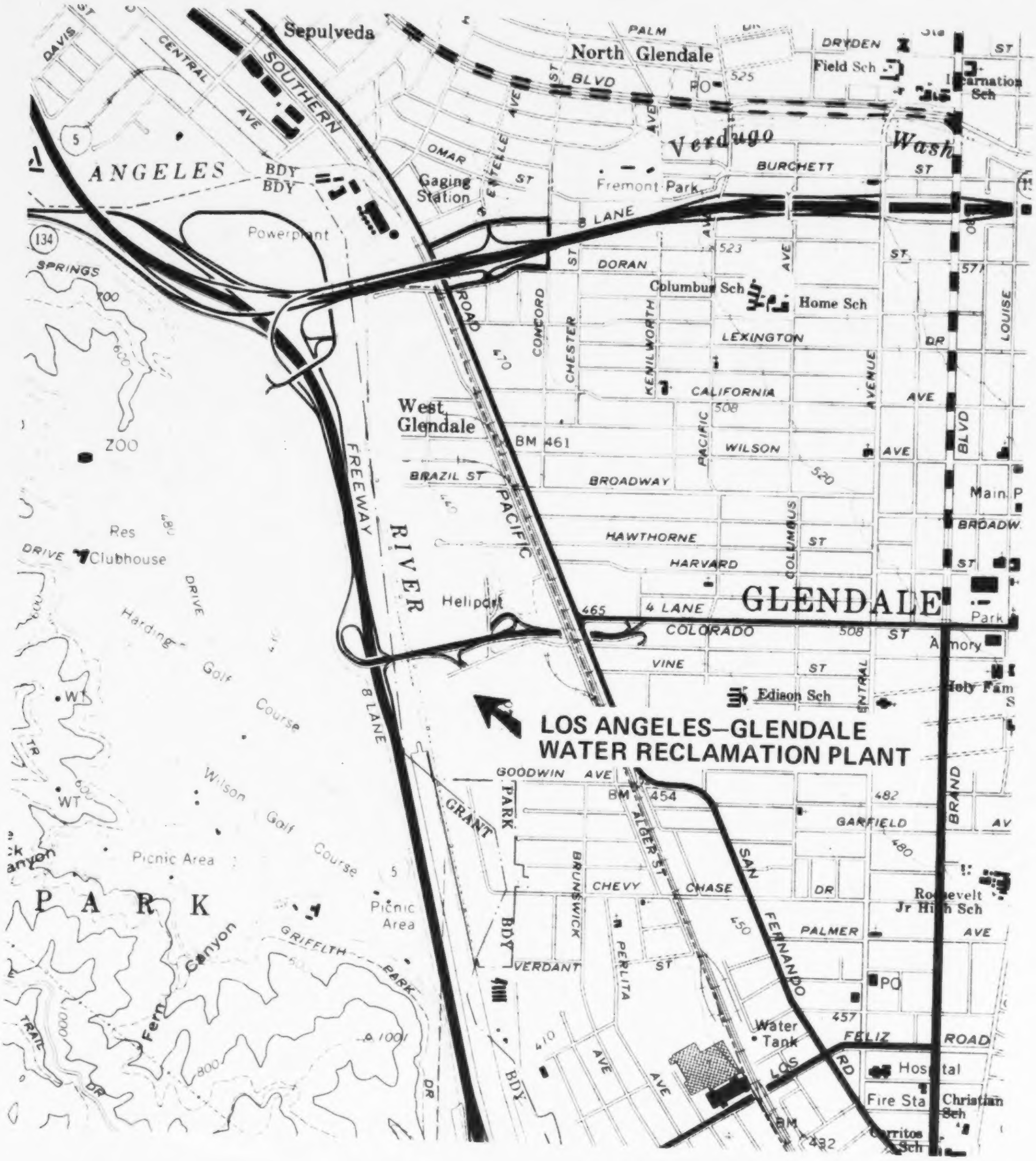
As required by the State Water Resources Control Board, a licensed Class V Operator (Engineer) would be responsible for the overall operations of the Sepulveda Plant. The plant would be manned seven days per week, 24 hours per day. Table VII-12 gives a list of the job classifications and the number of persons in each for the anticipated work force required to operate and maintain the plant. The total labor requirements for the life of the 40 mgd unit would be 990 manyears, 320 manyears for the 30 mgd unit, and 56 manyears for the 15 mgd unit.

Maintenance would be performed similarly to that described for the Hyperion Plant except for the sludge processing equipment, since there will be no sludge processed for disposal at the SWRP.

c. Los Angeles-Glendale Water Reclamation Plant Addition. Alternative B4C includes the construction of a 10 mgd modular addition to the Los Angeles-Glendale Water Reclamation Plant in 1988 and 1989, which, together with the other treatment units already described, will complete the hydraulic and treatment relief requirements for the duration of the planning period. The site is shown on Figure VII-15. Unit processes to be added would be constructed in parallel with the existing units, and would include additional primary tanks, aeration tanks, secondary tanks,

Table VII-12. Personnel requirements for the Sepulveda Plant.

TITLE	INCREASE WITH		
	40 MGD PLANT	30 MGD ADDITION	15 MGD ADDITION
Senior Clerk Typist	1	0	0
Clerk Typist	1	1	0
Senior Gardener	1	0	0
Gardener Caretaker	3	1	0
Custodian	1	1	1
Storekeeper	1	1	0
Instrument Repairman	1	1	0
Mechanical Helper	1	1	1
Mechanical Repairman	2	1	1
Electrician	1	1	1
General Foreman	1	0	0
Plant Attendant	5	1	1
Sewage Plant Operator	9	0	0
Intermediate Sewage Plant Operator	4	0	1
Senior Sewage Plant Operator	1	0	0
Laboratory Assistant	2	1	0
Laboratory Technician	2	1	0
Chemist	2	1	0
Sanitary Engineering Assistant	1	0	0
Sanitary Engineering Associate	1	0	0
Sanitary Engineer	1	0	0
Pipefitter	1	1	1
Park Maintenance Supervisor	1	0	0
Building Repairman	1	1	1
TOTAL	45	14	8



LOS ANGELES–GLENDALE WATER RECLAMATION PLANT

Sepulveda
SOUTHERN
North Glendale
Verdugo Wash
ANGELES
BDY
Gaging Station
Powerplant
Fremont Park
8 LANE
134
5
SPRINGS
DORAN
Columbus Sch
Home Sch
LEXINGTON
CALIFORNIA
ZOO
West Glendale
BM 461
WILSON
BROADWAY
BRAZIL ST
PACIFIC
RIVER
FREEWAY
HAWTHORNE
HARVARD
GLENDALE
Res
Clubhouse
Harding Golf Course
Heliport
4 LANE
COLORADO
VINE
Edison Sch
Armory
WT
Wilson Golf Course
Picnic Area
PARK
Fern Canyon
GRIFFITH PARK
GOODWIN AVE
BM 454
GRANT
ALGER ST
SAN FERNANDO RD
GARFIELD
CHEVY CHASE
BRUNSWICK
PERLITA
PALMER
Roosevelt Jr High Sch
VERDANT ST
PO
Water Tank
FELIZ ROAD
LOS
Hospital
Fire Sta
Christian Sch
BRAND BLVD
Carnation Sch
Field Sch
DRYDEN
PALM
BURCHETT
CONCORD
CHESTER
KENILWORTH
COLUMBUS
CENTRAL
LOUISE
Main P
Park
Holy Fam
198P–78

Figure VII-15. Location of the Los Angeles-Glendale Water Reclamation Plant.

filtration units, chlorination units, waste and return activated sludge systems, and additional control and monitoring facilities. The plant service area is shown on Figure VII-7. Approximately 104 manyears of labor will be required for construction of the 10 mgd addition.

Plant effluent is expected to meet constituent requirements. Effluent quality is discussed in Chapter VIII.

As with the 20 mgd facility, influent to the 10 mgd addition would be diverted from the NCOS-NOS Interceptor Sewer System, and sludge removed from the treatment processes will be returned to the NCOS-NOS for transport to the HTP for centralized solids processing.

As with the 20 mgd facility, the 10 mgd addition would be supplied with a dual power source, each entirely independent of the other. In the event of a power failure to the primary power system, plant personnel would manually switch to the secondary power source to continue plant operation. In the event of total plant power failure, flow diversion from the NCOS-NOS to the plant will be completely stopped, allowing the flow to be transported directly to the HTP for treatment.

The location of the Los Angeles-Glendale Plant is such that, together with incorporated site grading and drainage facilities, the plant could remain fully operational during rainfall equivalent to a 250-year flood.

The proposed 10 mgd modular addition to the Los Angeles-Glendale Water Reclamation Plant will be fully integrated with the initial 20 mgd facility so that operation and maintenance procedures will continue as if the enlarged plant was one treatment system or facility. Additional personnel will be required, however, for operation and maintenance purposes due to the proposed increase in treatment capacity. The total plant, after the addition, will continue to be operated at a constant flow rate (30 mgd) and will provide full secondary treatment of all plant influent with tertiary filtration of secondary effluent to provide a high quality plant effluent suitable for reuse purposes.

A licensed Class V Operator will be responsible for the overall operations of the Los Angeles-Glendale Plant. The plant will be manned seven days per week, 24 hours per day. Table VII-13 gives a list of the job classifications and the number of persons in each for the anticipated work force required to operate and maintain the plant. A total of about 84 manyears of labor will be required over the operating life of the 10 mgd addition.

Maintenance will be performed similarly to that described for the Hyperion Plant, except for the sludge processing facilities.

d. East Valley Interceptor Sewer, Units I and II. In order to deliver sewage to the Sepulveda Plant and relieve the NOS-NCSFVRS tunnel, the East Valley Interceptor Sewer, Units I and II, would be constructed in the San Fernando Valley.

Table VII-13. Personnel requirements for the Los Angeles-Glendale Water Reclamation Plant.

TITLE	20 MGD PLANT	INCREASE WITH 10 MGD ADDITION
Senior Clerk Typist	1	0
Gardener Caretaker	2	1
Custodian	1	1
Building Maintenance Supervisor	1	0
Pipefitter	1	1
Mechanical Helper	1	2
Mechanical Repairer II	1	1
Instrument Mechanic	1	0
Electrician	1	0
Sewage Plant Operator	6	2
Intermediate Sewage Plant Operator	4	1
Senior Sewage Plant Operator	1	0
Plant Attendant	2	1
Chemist I	1	0
Laboratory Assistant	2	1
Laboratory Technician	1	0
Sanitary Engineering Associate	1	0
Sanitary Engineer	1	0
Clerk Typist	0	1
TOTAL	29	12

All of Unit I would be constructed of plastic-lined reinforced concrete pipe. All of Unit II would be constructed of vitrified clay pipe. Table VII-14 gives the pipe sizes, slopes, and lengths of pipe for the various subunits of Units I and II. Figures VII-16 and VII-17 show the proposed alignment for Units I and II, and the expected flow rates.

Construction of the East Valley Interceptor Sewer, Unit I, is expected to begin in 1978 with 135 manyears of labor required and a total construction time of approximately 2 years. Unit II would be constructed in 1982 and 1983, and would require 80 manyears of labor. Operations over the life of the projects will require about 12.5 manyears of labor for Unit I and another 6.2 manyears for Unit II.

e. Griffith Park Reclaimed Water Delivery System. Approximately 18.5 mgd of plant effluent from the LAGWRP is available for reclaimed water uses. By agreement between the Cities of Los Angeles and Glendale, the plant effluent will be divided equally for use by each City. The City of Glendale proposes to use its share of the reclaimed water in a steam generating plant. The exact construction and implementation schedule for this reuse purpose is unknown at this time.

The City of Los Angeles proposes to use approximately 9 mgd of its share of the plant effluent for irrigation purposes in Griffith Park. The delivery and distribution system will include a transmission pipeline from the plant to Griffith Park, a pumping station, water reservoir, and distribution piping and appurtenances. It is anticipated that this irrigation system will be constructed upon approval of the Griffith Park Master Plan, which is currently being prepared. In the interim, plant effluent will be discharged into the adjacent Los Angeles River Flood Control Channel.

About 14 manyears of labor would be required for construction of the water delivery system. During the operational phase, approximately 47 manyears of labor will be required.

f. Sepulveda Dam Recreation Area Reclaimed Water Delivery System. Upon completion of the Sepulveda Facility, approximately 38 mgd of plant effluent would be available for reclaimed water uses. With subsequent plant additions, total flow available for reclaimed water uses would be approximately 80 mgd by the year 2000. Ultimately, the City proposes to use much of this reclaimed water for groundwater recharge, contingent upon favorable findings from current studies involved with possible viral effects of such reuse. In the interim, however, the City proposes the construction of a delivery and distribution system to use plant effluent for irrigation purposes in the Sepulveda Dam Recreation Area, primarily to irrigate existing and proposed golf courses. The system would consist of supply pipelines, a pumping station, and distribution piping and appurtenances. Figure VII-18 shows the proposed distribution system

Table VII-14. East Valley Interceptor Sewer, Units I and II, subunit information.

SUBUNIT	PIPE SIZE (INCHES)	LENGTH (FEET)	SLOPE	DESIGN FLOW (cfs)
I-A	81 69	2,100 1,834	0.00086 0.00135	144.5 110.1
I-B	69	4,942	0.00112 and 0.00131	110.1 106.9
I-C	60 to 69	5,117	0.0010 to 0.00367	87.3
I-D	60	5,470	0.00150 and 0.00192	87.3 75.1
II-A	39	4,836	0.00784 to 0.00532	54.3
II-B	33 to 39	5,843	0.00782 to 0.01261	54.3 to 50.6
II-C	36	7,596	0.00371 to 0.00790	44.7 to 41.3
II-D	42 39	3,667 872	0.00134 0.00199	31.2

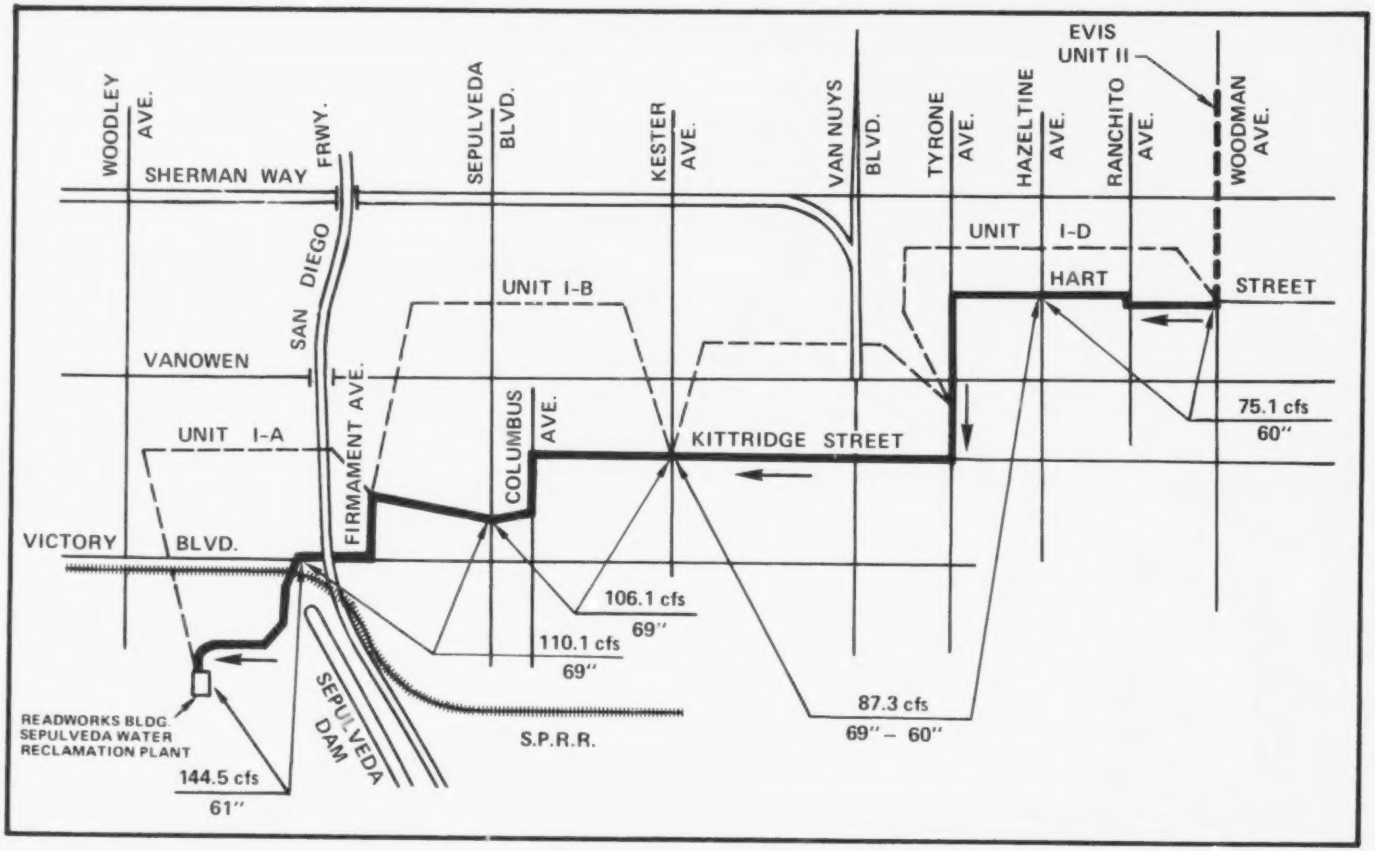

EVIS
UNIT II
WOODLEY AVE.
SHERMAN WAY
SAN DIEGO FRWY.
SEPULVEDA BLVD.
KESTER AVE.
VAN NUYS BLVD.
TYRONE AVE.
HAZELTINE AVE.
RANCHITO AVE.
WOODMAN AVE.
UNIT I-D
HART
STREET
UNIT I-B
VANOWEN
FIRMAMENT AVE.
COLUMBUS AVE.
KITTRIDGE STREET
75.1 cfs
60"
UNIT I-A
VICTORY
BLVD.
106.1 cfs
69"
110.1 cfs
69"
READWORKS BLDG.
SEPULVEDA WATER
RECLAMATION PLANT
SEPULVEDA
DAM
S.P.R.R.
87.3 cfs
69" - 60"
144.5 cfs
61"

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Figure VII-16. East Valley Interceptor Sewer Unit I—project map.

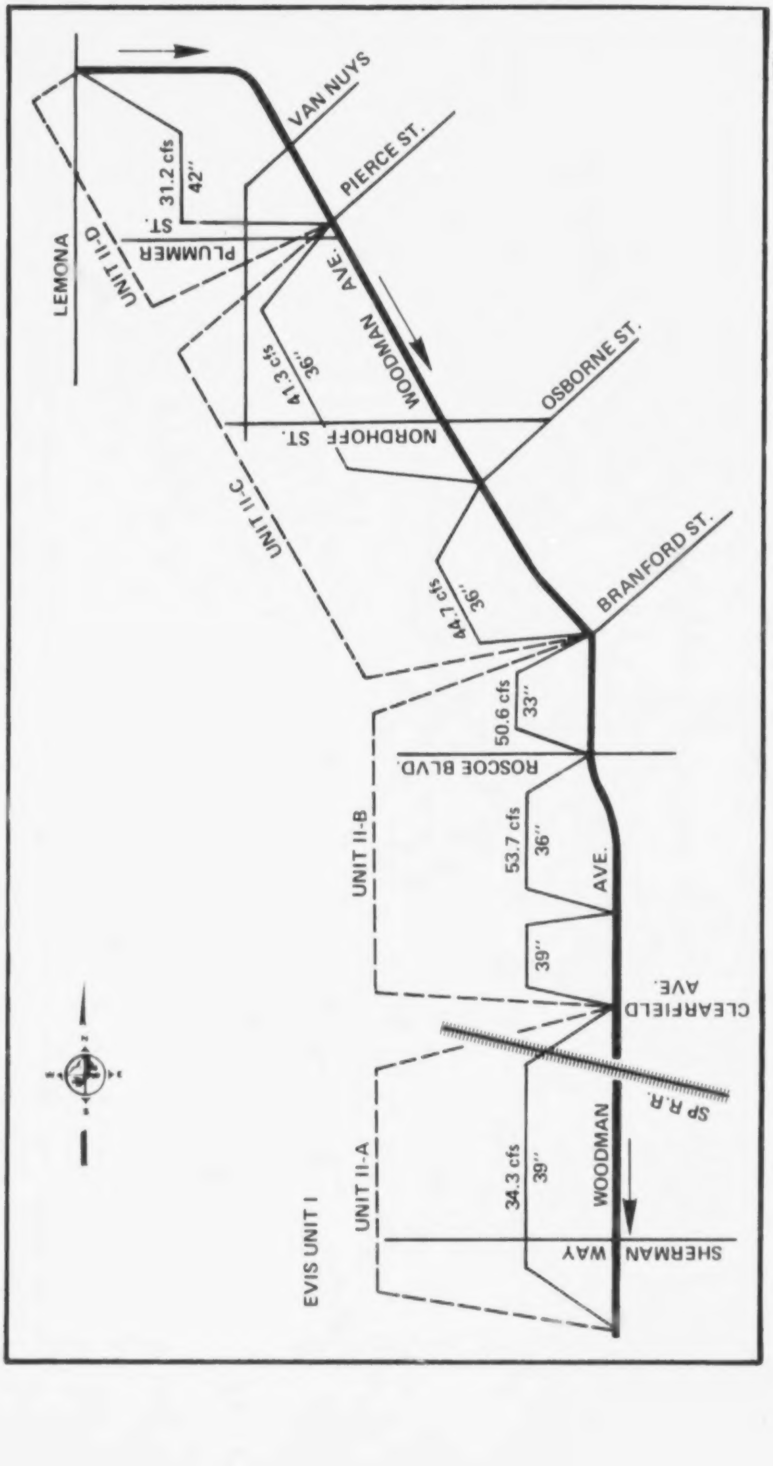
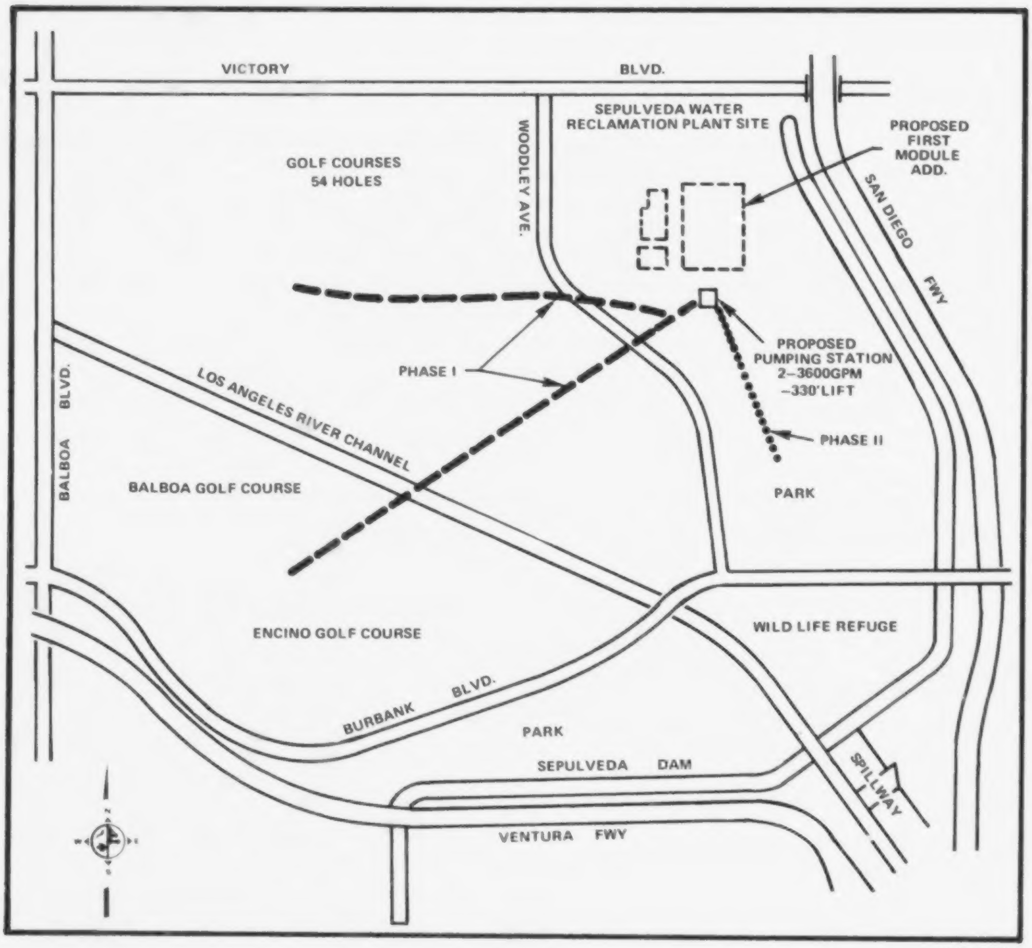

198P-344
LEMONA
UNIT II-D
PLUMMER ST.
31.2 cfs
42"
VAN NUYS
PIERCE ST.
WOODMAN AVE.
41.3 cfs
36"
NORDHOFF ST.
OSBORNE ST.
UNIT II-C
44.7 cfs
36"
BRANFORD ST.
50.6 cfs
33"
ROSCOE BLVD.
UNIT II-B
53.7 cfs
36"
AVE.
39"
CLEARFIELD AVE.
SP R.R.
UNIT II-A
34.3 cfs
39"
WOODMAN
EVIS UNIT I
SHERMAN WAY
N

Figure VII-17. East Valley Interceptor Sewer Unit II—project map.


VICTORY BLVD.
SEPULVEDA WATER RECLAMATION PLANT SITE
PROPOSED FIRST MODULE ADD.
GOLF COURSES 54 HOLES
WOODLEY AVE.
SAN DIEGO FWY
PHASE I
PROPOSED PUMPING STATION 2–3600GPM ~330'LIFT
PHASE II
LOS ANGELES RIVER CHANNEL
BALBOA BLVD.
BALBOA GOLF COURSE
PARK
ENCINO GOLF COURSE
WILD LIFE REFUGE
BURBANK BLVD.
PARK
SEPULVEDA DAM
SPILLWAY
VENTURA FWY

198P-345

Figure VII-18. Proposed irrigation system for Sepulveda Dam Recreational Area.

layout. Approximately 9 mgd is expected to be used for irrigation purposes commencing in 1980. Until other reclamation uses are developed, excess plant effluent would be discharged into the Los Angeles River Flood Control Channel.

About 13 manyears of labor will be required to construct the water delivery system. Operations over the life of the project would require about 31 manyears of labor.

3. COASTAL CAPACITY WITH RELIEF SEWER FOR THE SAN FERNANDO VALLEY (C3)

Under Alternative C3, 397 mgd of secondary treatment would be provided at the Hyperion Treatment Plant. The only other treatment facility would be the existing 20 mgd LA-Glendale Plant. The Additional Valley Outfall Relief Sewer, or AVORS, would be constructed to a capacity of 85 cfs to transport sewage wastes from the San Fernando Valley to the Hyperion Treatment Plant. The Woodman Avenue Relief Sewer, along the same alignment as the proposed EVIS Unit II, would be necessary to enlarge the service area which would be tributary to the AVORS addition. Alternative C3 also includes interim sludge processing at Hyperion Treatment Plant and operation of the Griffith Park Reclaimed Water Delivery System.

The costs of each project element of Alternative C3 are summarized in Table VII-15. A total of 6,068 manyears of direct labor would be required during construction and 7,886 manyears during operation for implementation of Alternative C3.

Table VII-15. Costs for major elements of Alternative C3 (in 1975 dollars).

PROJECT ELEMENT	CONSTRUCTION COST	OPERATION COST	TOTAL COST
HTP Sec. Conv. (397 mgd)	287,182,000	397,154,000	684,336,000
HTP Interim Sludge Proc. and Disposal	14,007,000	cost included above	14,007,000 (O&M included above)
AVORS (85 cfs)	42,377,000	3,192,000	43,633,000
Griffith Park RWDS (9 mgd)	819,000	2,218,000	1,729,000
Woodman Avenue (54 cfs)	2,672,000	170,000	2,729,000
Total	347,057,000	402,734,000	746,434,000

a. Hyperion Treatment Plant Conversion for Full Secondary Treatment and Sludge Disposal. Construction of HTP facilities for full secondary treatment of 397 mgd would require special engineering because of space limitations on the site. The Facilities Plan discusses space potentially available both on and offsite.

The capacity of the proposed conversion and expansion of the HTP secondary treatment facility is dependent on several factors: (1) the amount and relative location of available space at the plant site or space within the immediate vicinity of the plant; (2) the acquisition of offsite space; and (3) the constraints (physical, legal, or environmental) associated with the proposal.

The conversion and expansion is also affected by the time frame in which the project must be completed and the design criteria that must be met. Time schedules and effluent discharge requirements established by the state and federal agencies further dictates the implementation of the proposal.

As a result, a thorough investigation of the 144-acre site at Hyperion and surrounding properties was made by the City to determine the amount of usable available land for expansion and to identify the various constraints.

(1) ONSITE SPACES. Figure VII-19 shows the location and layout of the existing HTP facilities with the onsite spaces and adjacent properties which were investigated. Areas A through E are onsite spaces within the HTP boundary. The plant facilities vary approximately 50 ft to 120 ft below the surrounding landscape.

Area A, the land vacant in the northeast corner of the HTP site, is near the "Digester System." This land has been used, historically and up to the very recent past, for sludge drying beds. This usage has changed the soil-bearing capacity of the land to such an extent that the land is not presently usable for structures without soil removal and replacement.

Area B is located in the northwest section of the site along Vista Del Mar, just north of the Primary Settling System (east battery). Flows entering via outfall sewers are located in this section. Any below-surface construction would interfere and, therefore, any secondary conversion would be limited to aboveground construction.

Area C and a portion of Area D are spaces around the Administration Building which is presently reserved for parking, and are not functionally available for expanding the secondary system. Land around the Administration Building would complicate the design and construction of the secondary system because of its relative location to existing facilities that must remain in place, i.e., the existing clarifier system and the effluent pumping plant.

Area E, the slope area along the eastern perimeter of the site and the southern perimeter of the site, rises to elevations up to 150 ft. The slopes are greater than 2:1. Expansion would involve excavation of the sandy soil slope, the construction of a large retaining wall, and the protection or relocation of the high voltage electrical transmission towers situated at the top of slope. This is the area proposed for construction in the Facilities Plan.

The shaded area delineated on Figure VII-19 would provide for a total secondary treatment capacity of 307 mgd. By expanding into the slope area, a reactor and clarifier capacity incorporating a high rate process using pure oxygen for approximately 430 mgd could be provided with the construction of a 100-ft retaining wall at a cost of $22 million, not including the costs for special soil stabilization and transmission tower relocation. An increase above 307 mgd of 40 mgd would still require a 45-ft retaining wall at an approximate cost of $1 million, again excluding the costs for soil stabilization and tower relocation. An economical increase in capacity, represented by minimizing the retaining wall height and not relocating the transmission tower, would be about 25 mgd to 30 mgd.

Double-decking the existing secondary treatment units to increase plant capacity without the need to construct a high retaining wall was also investigated. Cost analysis revealed that a 307 mgd secondary clarifier system could be constructed for about $53 million or for $1.7 million per 10 mgd capacity. Double-decking the clarifiers to provide 60 mgd additional capacity would cost an estimated $23 million more or $3.8 million per 10 mgd increase. It can be seen that the unit cost of moderately increasing the clarifier capacity by double-decking is more than doubled.

The total cost of constructing 397 mgd secondary capacity at HTP would be about $287,182,000 as opposed to $171,282,000 for 307 mgd.

The general construction schedule and activities for HTP conversion described for Alternative B4C would also apply to Alternative C3, except that the retaining wall (if selected) would have to be constructed during the site preparation phase. Labor requirements for construction of Alternative C3 would be equivalent to 5,021 manyears.

Operations, including labor requirements, for the 397 mgd HTP plus interim sludge disposal would be essentially the same as those described for Alternative B4C.

(2) ADJACENT OFFSITE STUDY AREAS. Adjacent offsite properties surrounding the plant are shown in Figure VII-19. The properties bounding the HTP are the LAX International Airport (F) on the north, a residential community (G) in the City of El Segundo on the east, the Department of Water and Power's Scattergood Steam Plant (H) on the south, and the State Beach (I) on the west.

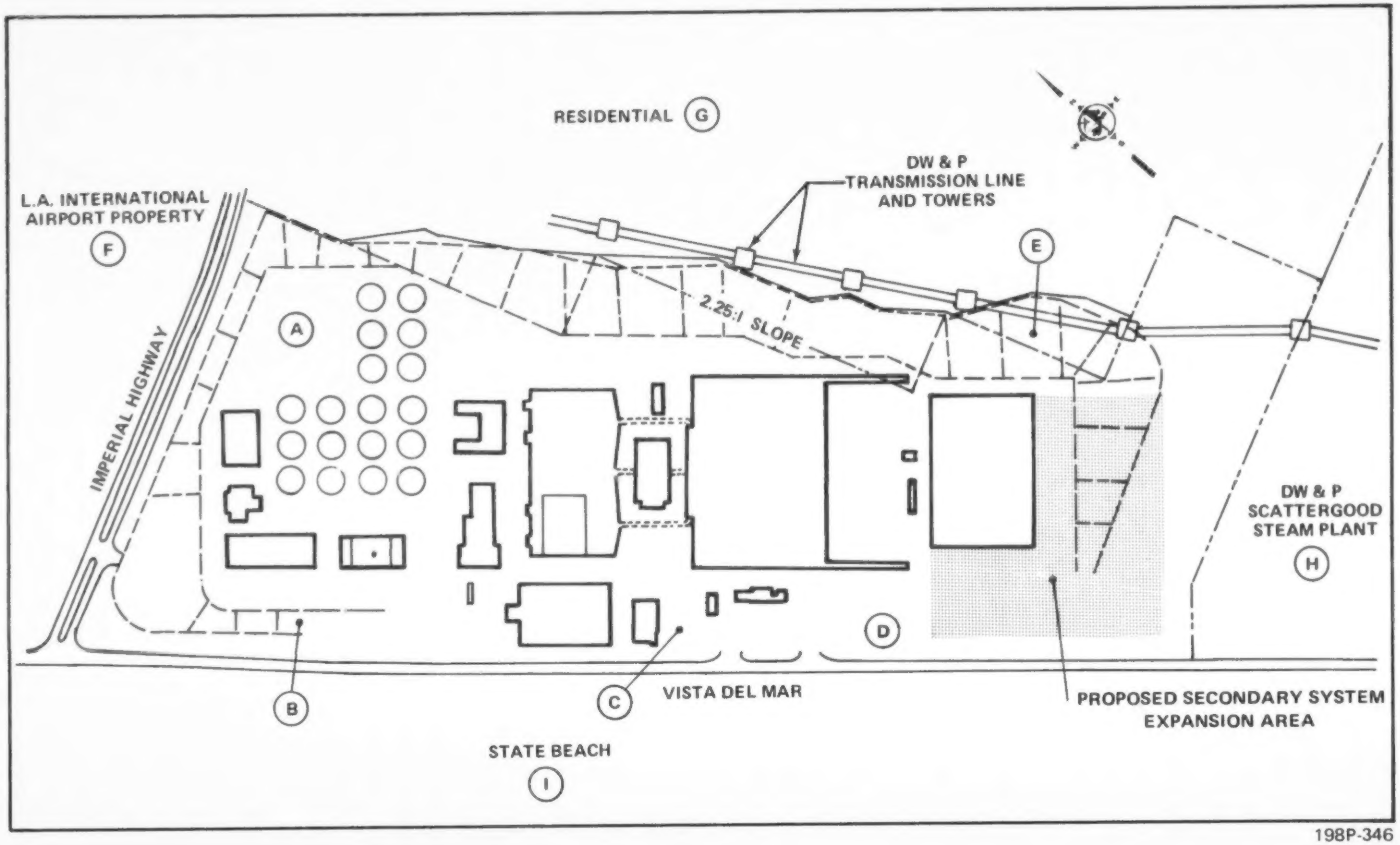

RESIDENTIAL Ⓖ
L.A. INTERNATIONAL AIRPORT PROPERTY
Ⓕ
DW & P TRANSMISSION LINE AND TOWERS
Ⓔ
Ⓐ
2.25:1 SLOPE
IMPERIAL HIGHWAY
DW & P SCATTERGOOD STEAM PLANT
Ⓗ
Ⓓ
Ⓑ
Ⓒ
VISTA DEL MAR
PROPOSED SECONDARY SYSTEM EXPANSION AREA
STATE BEACH
Ⓘ
198P-346

Figure VII-19. Existing HTP facilities and expansion study areas.

Area F, located adjacent to the site on the north, is owned by the Department of Airports. This area consists of sand dunes. The Federal Aviation Agency (FAA) and the Coastal Commission have a strong interest in preserving this area. The FAA operates a VHF Omni Range (VOR) Station in this area which is one link in a major network of air navigational control aids in Southern California. The VOR Station transmits high frequency radio waves in all directions continuously as directional information for aircrafts in the area. Studies to relocate this facility concluded that the extreme high costs make the relocation unfeasible. Also, the Department of Airports has an interest in developing an extension to the west of the existing runways with navigational aids. The Coastal Commission has placed the Airport sand dunes on their Conservation Priority Site List. The Los Angeles County Environmental Resources Committee has identified the sand dunes as the only salvageable coastal dunes in the County, and the City of Los Angeles has identified the area as "Ecologically Important Areas."

The adjacent area east of the site, Area G, is single-family, residential in the City of El Segundo. The Department of Water and Power right-of-way for high voltage transmission lines and tower from the Scattergood Steam Plant separates the residential community and the HTP. Any easterly expansion would involve considerable engineering complications because of the topography. Massive excavations and retaining walls would be needed to construct a plant at a single elevation, or the expanded facilities would have to be constructed on a different, much higher level. After the engineering problems are surmounted, the legal acquisition problems appear formidable. The expansion necessitates relocation of the Department of Water and Power's power distribution lines and condemnation of residential land in the City of El Segundo. The Los Angeles City Attorney's office has asserted that an order of immediate possession for land outside the City would only be possible if two conditions are met: that the land can be shown to be absolutely essential, and that no alternative land is available.

Area H, immediately south of Hyperion, is the Scattergood Steam Generating Plant, with facilities built right up to the Hyperion property line. Any southern expansion would mean relocation of a major portion of the facilities, a proposal the Department of Water and Power would not consider.

Area I, the western boundary of the site, is a state beach. Any western expansion would mean relocating Vista Del Mar onto state beach property, or building the expanded treatment facilities directly on the beach. The California Coastal Zone Conservation Commission has proposed policies to prohibit developments that interfere with the traditional public use of dry sand beaches, and to prohibit major public service facilities such as sewage treatment plants along the immediate shoreline unless there is an overriding engineering requirement to locate them. The environmental impacts make this all but unthinkable. Furthermore, public protest and opposition would delay completion and upgrading of HTP well beyond 1980.

(3) SURROUNDING SITES. Figure VII-20 shows four surrounding sites, Areas J through M, investigated in the vicinity of Hyperion for expansion of the HTP. These areas are located within a 3-mile radius of the present plant site, and appear to contain sufficient space needed to expand the plant's treatment capacity.

Area J, located south of the HTP, is a partially undeveloped area bounded by Mariposa Avenue (El Segundo), Aviation Boulevard, Marine Avenue (Manhattan Beach), and Sepulveda Boulevard. This area, owned by Standard Oil of California, is crisscrossed by railroads, contains industrial complexes, oil wells and petroleum processing facilities, a golf course, and other municipal facilities. This parcel is located in the Cities of El Segundo and Manhattan Beach. However, it appears that sufficient undeveloped area could be made available to construct a 150 mgd secondary (only) treatment plant. The total capital cost to provide the additional secondary treatment capacity at this site, including the cost of land, is approximately $54 million.

Areas K and L, located north of the HTP, are owned by the Department of Airports. Area K is an 80-acre site located west of Pershing Drive at the end of the existing airport runway. Area L is the abandoned Nike Site located along the northern boundary of the Los Angeles Airport. Unsuccessful negotiations have been underway since 1972 to use portions of Area K for sludge drying beds. Area L was transferred to the City's Airport Department by the federal government under the Surplus Property Act of 1944. The Department of Airports is negotiating the lease of this land for use as an aircraft maintenance school site and for recreational use. According to airport planners, much negotiation and project coordination with the Westchester community has occurred. The community would like to use this site for a golf course and tennis courts. However, resistance has occurred from the Coastal Commission which wants the area returned to sand dunes. Further constraints are placed on the land use by the Federal Aviation Agency. Both the Department of Airports and the Federal Aviation Administration are opposed to the construction of any permanent structures on the land.

Area M, owned by the Hughes Corporation, is located along Ballona Creek and Lincoln Boulevard West. The entire area is valued at $80 million (including contingencies and relocation assistance). This land could be obtained by an order of immediate possession within possibly six months; however, final acquisition would probably take much longer. Only a portion of the land would be needed for expansion of the HTP facilities. The total capital cost to provide an additional 150 mgd secondary treatment capacity is approximately $58 million.

b. Additional Valley Outfall Relief Sewer (AVORS). The AVORS would be constructed at 85 cfs capacity to provide hydraulic relief for the San Fernando Valley.

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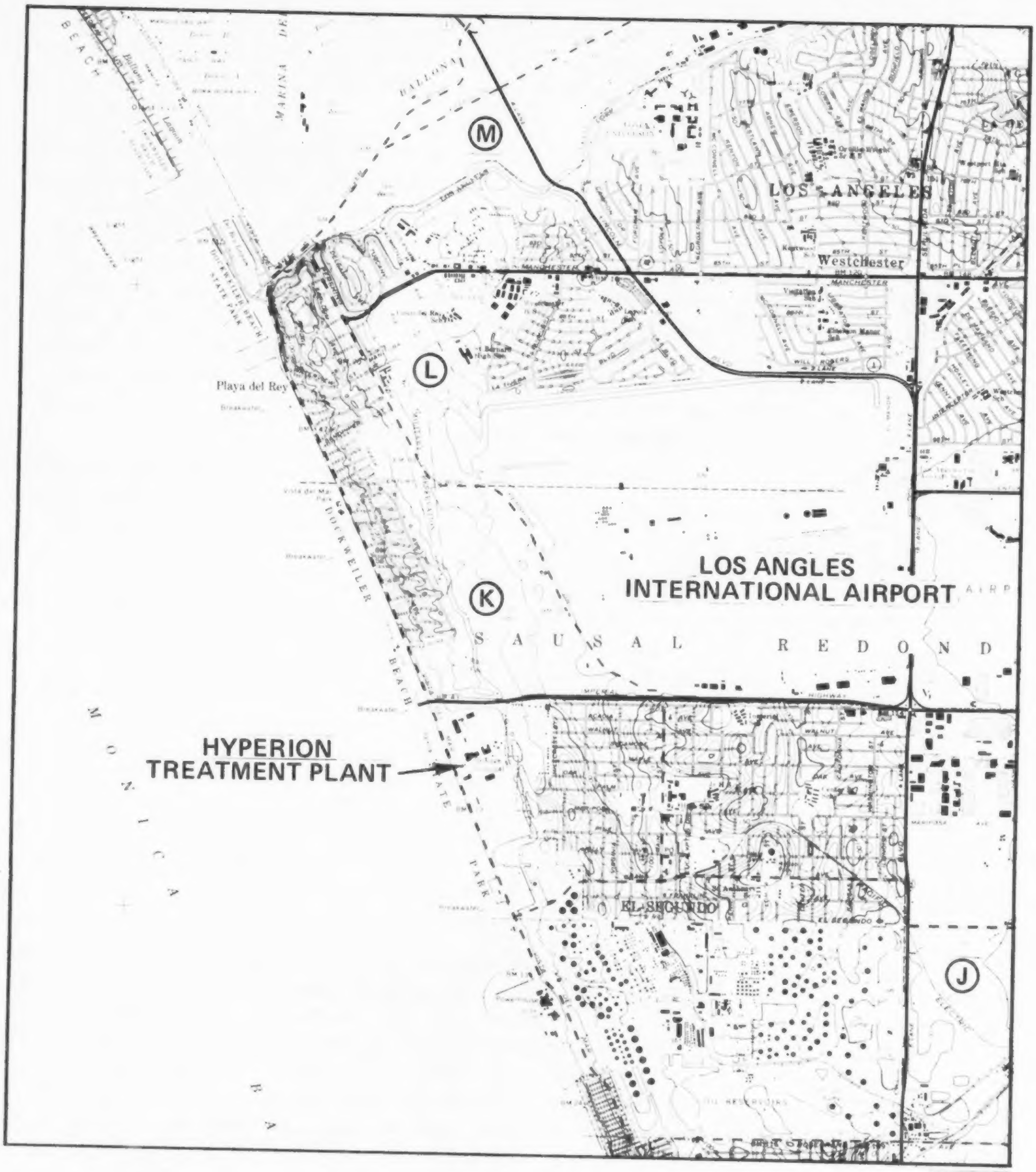
M
L
K
J
LOS ANGELES
Westchester
Manchester
Playa del Rey
MARINA DEL
BALLONA
LOS ANGLES
INTERNATIONAL AIRPORT
SAUSAL REDONDO
HYPERION
TREATMENT PLANT
EL SEGUNDO
DOCKWEILER BEACH STATE PARK
MONICA BAY

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Figure VII-20. Study areas of surrounding sites for HTP expansion.

The proposed AVORS would connect with an existing 5-mile segment already constructed east of Sepulveda Dam. An approximate 55,000-ft tunnel and trench would be used through the Santa Monica Mountains and would bring the sewer to its connection with NCOS in Culver City. The alignments of trench and tunnel portions of the project are shown on Figure VII-21. General design features and costs for the different segments of AVORS are given in Table VII-16.

AVORS would be constructed in 1977, 1978, and 1979 with a total direct labor requirement of approximately 741 manyears. Operation labor requirements over the life of the project would equal approximately 68 manyears.

c. Griffith Park Reclaimed Water Delivery System. This project would be the same as described for Alternative B4C.

d. Woodman Avenue Relief Sewer. The Woodman Avenue Relief Sewer would follow the same alignment as EVIS Unit II (see description for Alternative B4C). It would have a 54 cfs capacity, and would require 47 manyears of labor during construction and 4 manyears during operation.

4. INLAND-COASTAL SPLIT WITH MAXIMUM POTENTIAL FOR RECLAMATION (E2)

Alternative E2 includes project elements that would allow a maximum amount of water reclamation. Project elements are similar to those proposed for Alternative B4C with the major exceptions that a 75 mgd La Cienega Water Reclamation Plant would be operational in 1986, and that the initial 307 mgd unit at Hyperion would be modified after 1986 to treat 232 mgd with 50 mgd receiving advance treatment for reclamation. Provisions for including this flexibility in the 307 mgd Hyperion Unit would be complete in 1977.

Proposals for constructing and adding to the Sepulveda Water Reclamation Plant and the Los Angeles-Glendale Water Reclamation Plant are the same as described for Alternative B4C. Other common project elements include the Interim Sludge Processing and Disposal Program, the East Valley Interceptor Sewer Units I and II, the Griffith Park Reclaimed Water Delivery System, and the Sepulveda Dam Recreation Area Reclaimed Water Delivery System. As with other alternatives, implementation of the Interim Sludge Program and operation of the Griffith Park Reclaimed Water Delivery System are independent of other project elements.

Costs are summarized on Table VII-17. Total labor requirements would be 5,998 manyears during construction and 10,304 manyears during operation.

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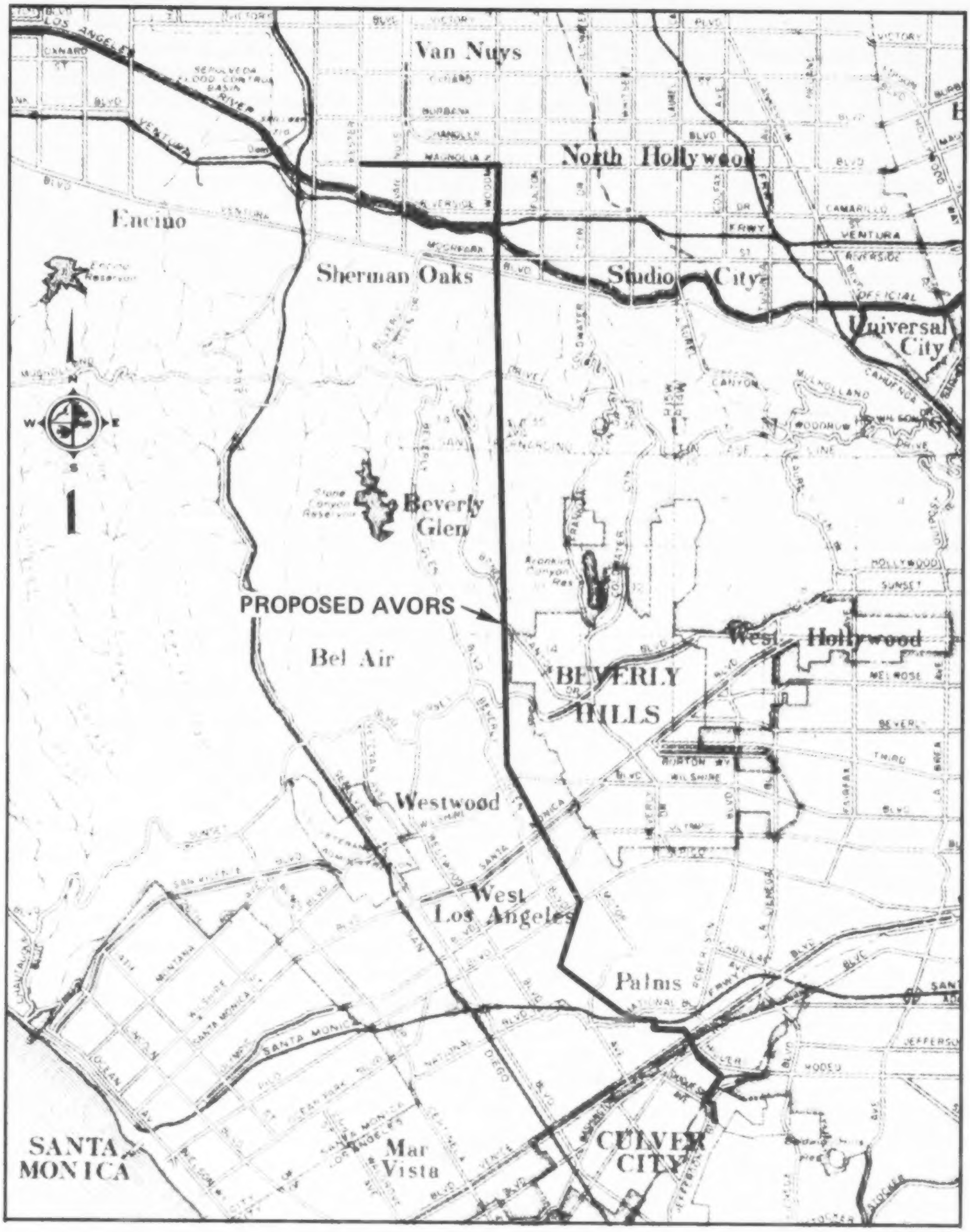
Van Nuys
North Hollywood
Encino
Encino Reservoir
Sherman Oaks
Studio City
Universal City
N
W
E
S
Stone Canyon Reservoir
Beverly Glen
PROPOSED AVORS
Bel Air
BEVERLY HILLS
West Hollywood
Westwood
West Los Angeles
Palms
SANTA MONICA
Mar Vista
CULVER CITY

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Figure VII-21. Location of the proposed AVORS.

Table VII-16. Design and cost analysis of AVORS.

DESIGN CAPACITY - 85 cfs					
SEWER SECTION	DIAMETER	LENGTH	AVERAGE DEPTH	CONSTRUCTION	$ CAPITAL COST
Magnolia Boulevard (Kester Avenue to Woodman Avenue)	63"	7,851'	>>30'	Trench	$ 2,818,823
Woodman Avenue and Southern Prolongation of (Magnolia Boulevard South to Strathmore Drive to Pico Boulevard to Butterfield Road)	45"	50,000'	>>30'	Tunnel-Santa Monica Mountains	26,700,000
Manning Avenue (Butterfield Road to Edith Street)	45"	4,760'	30'	Tunnel	2,541,840
Manning Avenue (Edith Street to Castle Heights)	45"	356'	>20'	Trench	71,271
Castle Heights (Extension) (Under the Santa Monica Freeway to Exposition Boulevard)	51"	562'	30'	Tunnel-Santa Monica Freeway	252,338
Exposition Boulevard (Castle Heights to Watseka Avenue)	51"	826'	16'	Trench	164,639
Canfield Avenue (Watseka Avenue to Venice Boulevard)	51"	1,937'	12'	Trench	360,515
Ince Boulevard (Venice Boulevard to Lucerne Avenue)	51"	2,797'	16'	Trench	557,498
Lucerne Avenue (Ince Boulevard to Duquesne Avenue)	57"	1,504'	14'	Trench	323,600
Duquesne Avenue (Lucerne Avenue to Jefferson Boulevard)	57" (inlet)	1,500'	12'	Siphon-Ballona Creek	939,645
Jefferson Boulevard [Duquesne Avenue to NCOS (join)]	57"	1,410'	12'	Trench	292,208
		73,504'		SUBTOTAL	35,022,377
				21% CONTINGENCIES	7,354,699
				TOTAL CAPITAL COST	42,377,076

Table VII-17. Costs for major elements of Alternative E2 (in 1975 dollars).

PROJECT ELEMENT	CONSTRUCTION COST	OPERATION COST	TOTAL COST
HTP Sec. Conv. (307 mgd)	171,282,000	371,582,000	542,864,000
HTP Flexibility to Lower Cap.	10,400,000	included above	10,400,000
HTP Interim Sludge Proc. and Disposal	14,007,000	included above	14,007,000
Sepulveda WRP (40 mgd)	38,356,000	44,968,000	83,324,000
Sepulveda WRP (30 mgd)	21,503,000	22,580,000	44,083,000
Sepulveda WRP (15 mgd)	11,569,000	3,948,000	15,517,000
EVIS I	7,731,000	588,000	8,319,000
EVIS II	4,604,000	289,000	4,893,000
La Cienega WRP (75 mgd)	56,189,000	58,500,000	114,689,000
LA-Glendale (10 mgd)	5,937,000	4,956,000	10,893,000
Griffith Park (9 mgd)	819,000	2,218,000	3,037,000
Sepulveda Dam (9 mgd)	758,000	1,432,000	2,190,000
Total	343,155,000	511,061,000	854,216,000

a. Hyperion Treatment Plant Conversions and Sludge Disposal. For Alternative E2, HTP would initially be converted to a capacity of 307 mgd secondary treatment. Construction and operation of HTP, including sludge disposal, would be similar to that described for Alternative B4C.

However, the HTP secondary conversion under Alternative E2 includes the incorporation of special features which would permit conversion of the treatment capacity from 307 mgd to 232 mgd concurrently with the construction of the 75 mgd La Cienega Water Reclamation Plant (LCWRP). The reduction in secondary treatment capacity would permit advance treatment of 50 mgd for reuse.

Additional modifications to permit conversion of the HTP capacity from 307 mgd to 232 mgd would include the following items:

- Full Oxygen Secondary Reactors. The reactor tanks would be constructed in a manner which would permit the covers and some of the interior walls to be removed without affecting the structural integrity of the remaining structure. Additional space would be included in the piping galleries to permit installation of the fine bubble air lines and electrical conduits. The influent and effluent conduits would be constructed so that one-quarter of the reactor tanks could be used for the second stage reactors (nitrification).

- Final Secondary Clarifiers. The influent and effluent conduits would be used for the second stage clarifiers (nitrification).

The additional cost of providing this flexibility at HTP, including contingencies and engineering, is estimated at $10,400,000, and the construction labor would require 182 manyears.

b. Sepulveda Facility. Construction and operation of the initial 40 mgd Sepulveda Water Reclamation Plant and the 30 mgd and 15 mgd additions would be the same as described for Alternative B4C.

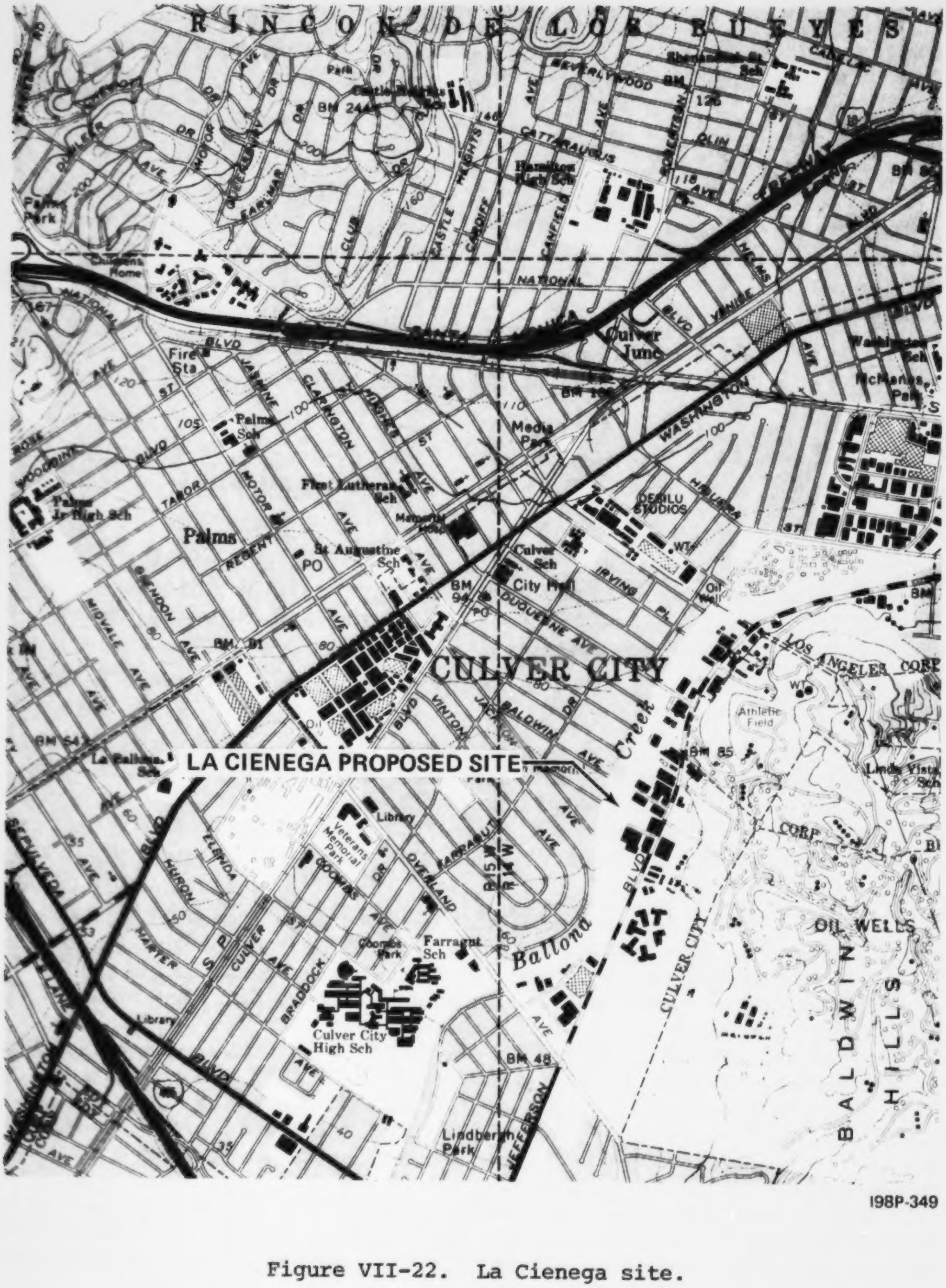
c. East Valley Interceptor Sewer. The EVIS Units I and II would be constructed and operated the same as described for Alternative B4C.

d. La Cienega Water Reclamation Plant. Figure VII-22 shows the proposed site for the La Cienega Water Reclamation Plant (LCWRP). The site is not presently owned by the City of Los Angeles, and probably would require several years for acquisition.

A simplified flow diagram of the proposed plant is shown on Figure VII-23.

The LCWRP would operate on a constant flow basis. The sludge would be delivered directly to the HTP digesters via a separate conduit. If all the reclaimed effluent were not immediately marketable, and assuming that HTP had been downrated so that sufficient capacity were not available for treatment there, the treated LCWRP effluent would be discharged to Ballona Creek.

However, Ballona Creek has a capacity for much less than a 50-year storm frequency. Whether the City would be permitted to discharge into Ballona Creek during major storms is yet to be resolved with the Los Angeles County Flood Control District. If such discharges were prohibited, the plant could divert the effluent into the NOS-LCSFVRS. The effluent could not routinely be returned to the sewer for transport to HTP because the economic advantage of UNOX at HTP is not realized with a dilute (relatively good quality) influent, and the purpose of the LCWRP would be entirely defeated. During temporary problems, flow normally going to LCWRP could be allowed to remain in the NOS-LCSFVRS Interceptor Sewer System and be treated at the HTP. The sewer system will have capacity for the year 2000 projected flows, and if storm period diversions were to be required, HTP would have to retain secondary treatment capacity sufficient to accommodate the temporary increases in influent volume.


RINCON DE LOS BUEYES
LA CIENEGA PROPOSED SITE
CULVER CITY
Palms
Culver Junc
Media Park
DESILU STUDIOS
Culver Sch
City Hall
Palms Sch
Palms Jr High Sch
First Lutheran Sch
St Augustine Sch
PO
Fire Sta
Hamilton High Sch
Children's Home
La Ballona Sch
Veterans Memorial Park
Library
Coombs Park
Farragut Sch
Culver City High Sch
Lindberg Park
Athletic Field
Linda Vista Sch
Washington Sch
McManus Park
Ballona Creek
LOS ANGELES CORP
OIL WELLS
BALDWIN HILLS
Oil Well
NATIONAL
WASHINGTON
VENICE BLVD
NATIONAL BLVD
CULVER
SEPULVEDA
JEFFERSON
OVERLAND
DUQUESNE AVE
IRVING PL
MOTOR AVE
REGENT
TABOR
CATTARAUGUS
BEVERLYWOOD
CLUB
CASTLE HEIGHTS
CARDIFF
CANFIELD
HELMS
ROBERTSON
BM 244
BM 125
BM 105
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BM 91
BM 54
BM 85
BM 48
R15W
R14W

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Figure VII-22. La Cienega site.

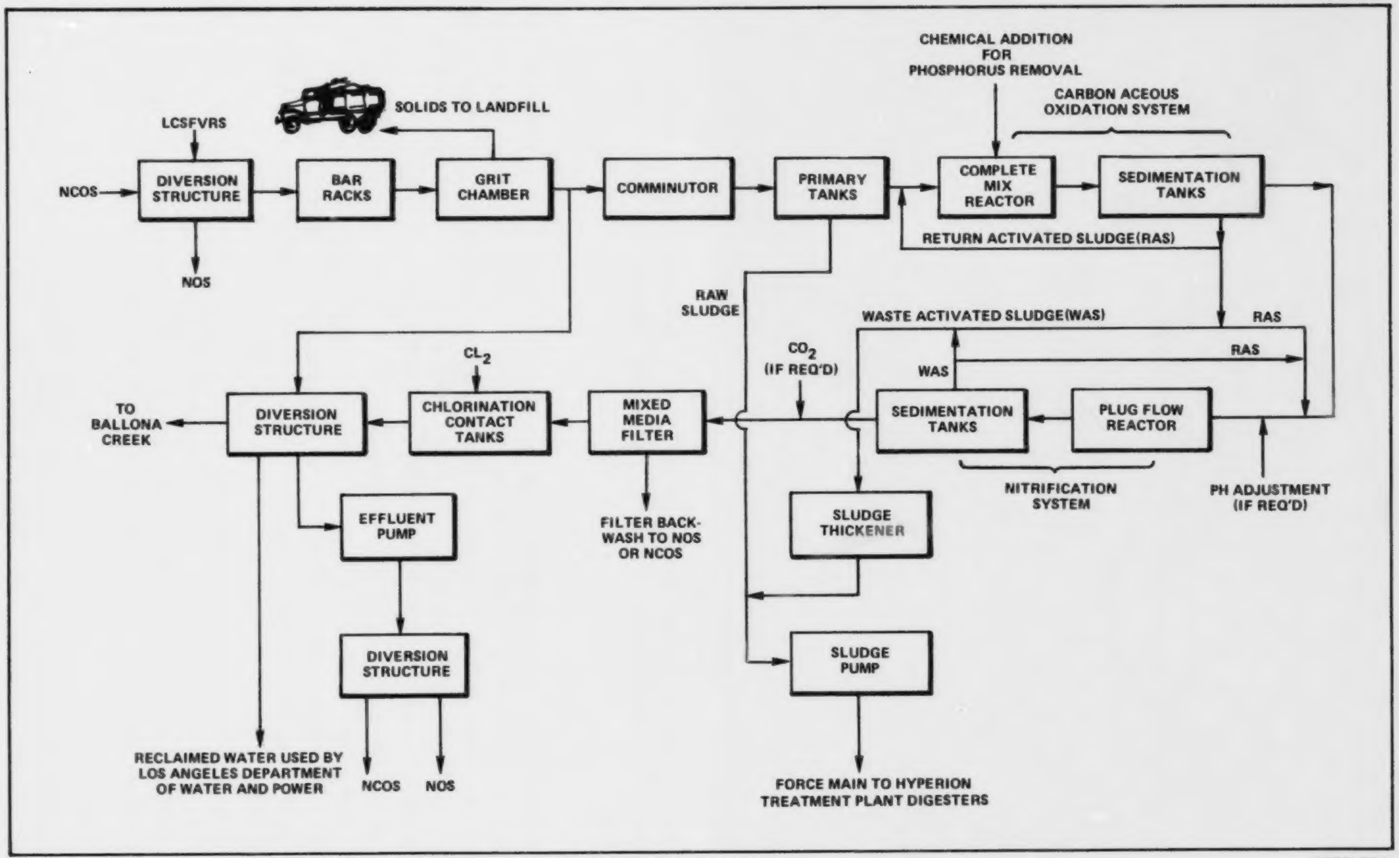
NCOS
LCSFVRS
DIVERSION STRUCTURE
NOS
BAR RACKS
GRIT CHAMBER
SOLIDS TO LANDFILL
COMMINUTOR
PRIMARY TANKS
CHEMICAL ADDITION FOR PHOSPHORUS REMOVAL
CARBON ACEOUS OXIDATION SYSTEM
COMPLETE MIX REACTOR
SEDIMENTATION TANKS
RETURN ACTIVATED SLUDGE(RAS)
RAW SLUDGE
WASTE ACTIVATED SLUDGE(WAS)
RAS
RAS
WAS
CO_2 (IF REQ'D)
SEDIMENTATION TANKS
PLUG FLOW REACTOR
NITRIFICATION SYSTEM
PH ADJUSTMENT (IF REQ'D)
CL_2
TO BALLONA CREEK
DIVERSION STRUCTURE
CHLORINATION CONTACT TANKS
MIXED MEDIA FILTER
FILTER BACK-WASH TO NOS OR NCOS
SLUDGE THICKENER
EFFLUENT PUMP
DIVERSION STRUCTURE
SLUDGE PUMP
RECLAIMED WATER USED BY LOS ANGELES DEPARTMENT OF WATER AND POWER
NCOS
NOS
FORCE MAIN TO HYPERION TREATMENT PLANT DIGESTERS

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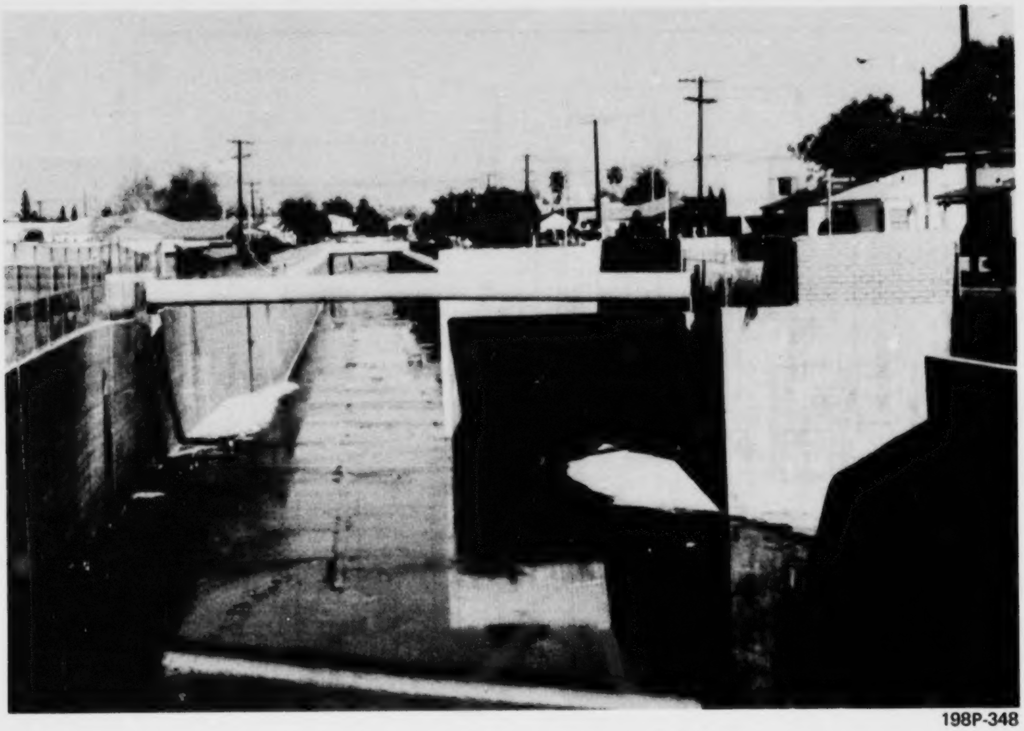
Figure VII-23. Flow diagram of 75 mgd La Cienega Water Reclamation Plant.



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Ballona Creek's capacity of less than a 50-year storm may prevent the discharge of LCWRP reclaimed water during major storms.

The LCWRP will be provided with a combined dual power system, each independent of the other. To assure plant operation in the event of a power failure, switching from one system to the other will occur automatically. Should total power failure occur, the flow to the plant would be stopped, using the bypass system described above.

The proposed location of the LCWRP is not subject to flooding, and the plant, therefore, should remain in operation under major rainfall conditions. However, the potential restrictions on discharge of reclaimed effluent into Ballona Creek during storms could result in temporary plant shutdowns.

Labor requirements for LCWRP during construction would equal 982 man-years. During operation, approximately 990 manyears would be needed. Personnel requirements have not been determined but would be similar to those listed for the Sepulveda 40 mgd plus 30 mgd units.

e. Los Angeles-Glendale Water Reclamation Plant Addition. The LA-Glendale Water Reclamation Plant 10 mgd addition would be constructed and operated the same as described for Alternative B4C.

f. Griffith Park Reclaimed Water Delivery System. The Griffith Park Reclaimed Water Delivery System would be constructed and operated the same as described for Alternative B4C.

g. Sepulveda Dam Recreation Area Reclaimed Water Delivery System. The Sepulveda Dam Recreation Area Reclaimed Water Delivery System would be constructed and operated the same as described for Alternative B4C.

E. financing for the city preferred project

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E. FINANCING FOR THE CITY PREFERRED PROJECT

Appendix E to the Facilities Plan discusses the "Financial Plan and Revenue Program" for funding Alternative B4C which was selected by the City as their preferred project. Similar methods of financing would be used for any alternative that is finally approved, but total costs would differ if a different alternative were eventually selected. Construction and operation costs are funded in different manners and are presented separately in the following summary of Appendix E.

1. FINANCIAL PLAN

The Financial Plan is the City's strategy for financing construction costs of the major projects described as the "Selected Plan" in the *Facilities Plan,* as well as other projects included in the Five-Year Capital Improvement Program. Costs for all major alternatives considered in the EIS are summarized on Table VII-7. Based on the costs of construction for Alternative B4C (excluding construction to occur after 1985) plus the projects included in the 1977-1982 Five-Year Capital Improvement Program, the City estimated the total cost of the projects to be about $498 million. The estimated cost for the projects scheduled through the 1981-1982 fiscal year is approximately $445 million.

Although the primary source of capital funds has historically been general obligation bonds, several other sources are also in use. These include City general fund monies covering some design and indirect employee costs, state and federal grants covering up to 87.5 percent of planning and construction costs of eligible projects, revenues from agencies that have contracts with the City for wastewater treatment services.

Of the total cost, $445 million needed through fiscal year 1981-1982, approximately $328 million is anticipated from existing bond funds, general funds, contractual agreements and state and federal grants. Of the remaining $117 million, about $35 million will not be needed until after 1981-1982 for completion of design and/or construction. The balance of funds required for immediate financing, therefore, is about $82 million.

The City previously determined that $96 million would be necessary to construct the projects scheduled through fiscal year 1980-1981. After investigation and analysis by the City Administrative Officer and the City Engineer, the Council voted to place a $96 million revenue bond issue on the November 2, 1976 ballot. The measure would have provided for the repayment of the bonds through a sewer user charge structure to be instituted before the bonds were sold.

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The $96 million revenue bond issue appeared on the November 2, 1976 ballot but was defeated by a vote of 410,173 to 372,252. A simple majority was required for passage.

The $96 million bond issue was based on the City's 1976-1981 Five Year Capital Improvement Program. The City reevaluates this program annually; therefore, the new 1977-1982 Program is now finalized. The new list of projects, with the City funds required for each project, is included in Supplement E-1. The new Program will require $82 million in City funds, $14 million less than last year. This was accomplished by deferring some projects which are not mandated by federal and state government and deleting projects that were financed by other means.

The City Council is reevaluating the alternatives for financing the program. If they select a revenue bond issue again, this time of $82 million, the next scheduled election is June 6, 1978. Thus, with normal processing, the money would not be available until December, 1978. The only way the bonds could be approved earlier would be to hold a special election, which is extremely expensive. The repayment schedule for the $82 million revenue bond issue is shown in Table VII-18.

Other alternatives for financing that are being considered include general obligation bonds, sewer service charges, general fund revenues, and revenues raised through special taxation. Most methods of raising revenues require two-thirds majority voter approval.

2. REVENUE PROGRAM

The Revenue Program is the City's strategy to finance the additional operation and maintenance costs associated with projects proposed for construction.

With the passage of Public Law 92-500, the Federal Water Pollution Control Act Amendments of 1972, modifications to the City's method of financing its wastewater system became necessary to qualify for grant funding. Section 204(b) provides that, after March 1, 1973, no grant will be approved unless the applicant has adopted a system of charges which ensures that each user of the applicant's treatment works pays his proportionate share of the costs of operation and maintenance (including replacement) of any waste treatment services provided by the applicant. The Environmental Protection Agency (EPA) has published regulations under Title 40 CFR further defining an equitable charge system.

The State Water Resources Control Board (SWRCB), in charge of administering the grant program in California, included and expanded the federal requirements which are incorporated as Section 2150 of the Clean Water Grant Program Regulations and Revenue Program Guidelines for Wastewater Agencies.

Table VII-18. Repayment schedule for $82 million revenue bond issue.

YEAR	PRINCIPLE	INTEREST	TOTAL	AVERAGE RESIDENT CHARGE/MONTH
1979-1980	$4,100,000	$5,740,000	$9,840,000	$0.58
1980-1981	4,100,000	5,453,000	9,553,000	.57
1981-1982	4,100,000	5,166,000	9,266,000	.55
1982-1983	4,100,000	4,879,000	8,979,000	.53
1983-1984	4,100,000	4,592,000	8,692,000	.51
1984-1985	4,100,000	4,305,000	8,405,000	.50
1985-1986	4,100,000	4,018,000	8,118,000	.48
1986-1987	4,100,000	3,731,000	7,831,000	.46
1987-1988	4,100,000	3,444,000	7,544,000	.45
1988-1989	4,100,000	3,157,000	7,257,000	.43
1989-1990	4,100,000	2,870,000	6,970,000	.41
1990-1991	4,100,000	2,583,000	6,683,000	.40
1991-1992	4,100,000	2,296,000	6,396,000	.38
1992-1993	4,100,000	2,009,000	6,109,000	.36
1993-1994	4,100,000	1,722,000	5,822,000	.34
1994-1995	4,100,000	1,435,000	5,535,000	.33
1995-1996	4,100,000	1,148,000	5,248,000	.31
1996-1997	4,100,000	861,000	4,961,000	.29
1997-1998	4,100,000	574,000	4,674,000	.28
1998-1999	4,100,000	287,000	4,387,000	.26

To comply with these requirements, the City will have to institute a residential sewer service charge and modify existing charges to commercial, industrial, and governmental users. These requirements will be met in the Revenue Program.

The City's present agreement calls for a proposed revenue program to be transmitted to the SWRCB by May 1, 1978, and for the enabling ordinances to be adopted by March 1, 1979. Preparation of the City of Los Angeles' revenue program consists of the following tasks:

1. Identification of flow, biological oxygen demand (BOD), and suspended solids (SS) loads imposed by each user or user class.
2. Identification of costs associated with wastewater treatment facilities.
3. Development of unit costs for flow, BOD, and SS.
4. Development of a method for collecting unit costs.
5. Enactment of necessary ordinances by City Council.

Task 1, a complete listing of existing industrial users within the City, has been completed, including the associated flows, BOD, and SS loadings. This information is included in Supplement E-V to the Facilities Plan. All loadings are based on fiscal year 1974-1975 data.

Task 2, identification of costs associated with wastewater treatment facilities, has been completed. The information is included in Supplement E-VI to the Facilities Plan. Costs include operation and maintenance, replacement, industrial cost recovery, and bond service for the proposed $82 million bond issue. Operation and maintenance costs are for fiscal year 1976-1977.

Task 3, development of unit costs for flow, BOD, and SS has been completed. They are included in Supplement E-V to the Facilities Plan.

Task 4, development of a method for collecting unit costs, has been completed. Residential users will pay based on the volume of water they use, and will be billed by the Department of Water and Power. The volume charge will include a component for quality. Commercial, industrial, and governmental users will also pay based on volume, but if they discharge wastes in excess of domestic strength, they will be surcharged. Nonresidential users are already paying volume charges and surcharges, but under this new revenue program, these rates will have to be adjusted. The industrial cost recovery component will be combined with the quality surcharge.

Task 5, enactment of necessary ordinances by the City Council, has been initiated. The City Engineer reported to the Board of Public Works, April 2, 1976, on a proposed method for complying with the revenue program requirements. The City Administrator's report, dated April 1, 1976, to the Council also recommended the same program. The Public Works Committee of the Council prepared a report to the Council on the City Engineer's and CAO's reports, but the report was submitted without recommendation. At its June 30, 1976 meeting, the Council ordered the Public Works Committee report be received and filed.

The estimated cost to the residential user to finance operation and maintenance, replacement, and bond redemption for the proposed bond issue will be about $0.90 per month per home in fiscal year 1977-1978. By fiscal year 1981-1982, the cost will increase to $2.65 per month.

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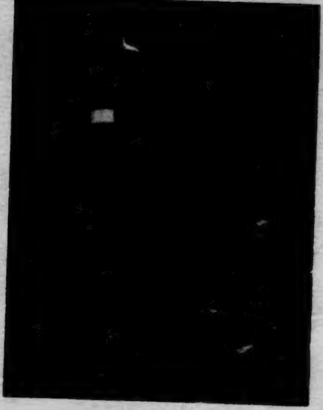

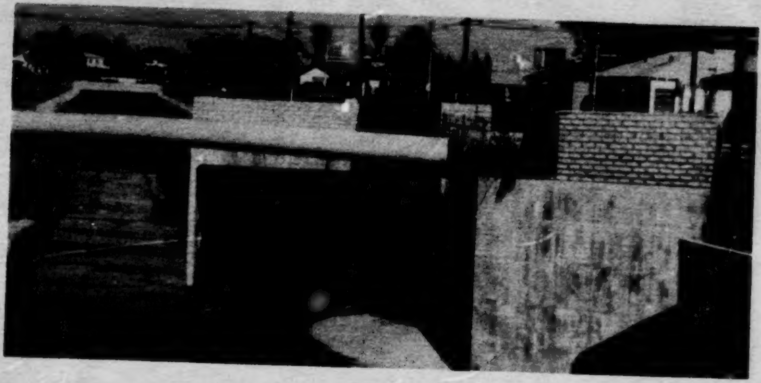

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Chapter VIII

primary impacts of major project alternatives

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A. construction phase primary impacts

A. CONSTRUCTION PHASE
PRIMARY IMPACTS

The Los Angeles City Facilities Plan describes a proposed project and several major alternatives. These were presented in Chapter VII. Implementation of the plan which is finally approved will result in construction of major facilities at several different sites. For a given site, different construction programs may be implemented depending on which facilities plan is selected. This section describing construction phase impacts of alternatives is organized by construction sites. The combinations of project elements that constitutes each major facilities plan alternative, and the anticipated construction periods, are summarized on Table VIII-1. Table VIII-2 gives construction costs and labor requirements for all project elements, and Table VIII-3 gives the total construction costs for alternatives.

1. HYPERION TREATMENT PLANT

a. Project Summary. Five alternative construction projects are being considered for the HTP. The No Project Alternative includes construction work that will be done even if further approvals for upgrading the Hyperion system are not given. The other alternatives being considered all provide for full secondary treatment of wastes discharged from HTP.

The No Project improvements of HTP could include adding up to 100 mgd of secondary treatment for a total of about 200 mgd, and modernizing and repairing outdated and deteriorating equipment. Most construction work would occur within the existing 144 acre HTP site. The work would be carried out during 1977 through 1982 and would require approximately 2,132 manyears of direct labor. Construction costs are estimated (in 1975 dollats) at $121,959,000. There would be brief interruptions of existing service during the construction phase as described in the discussion of water quality impacts (VIII.A.1.b(2).

The three possible project alternatives for HTP would all include modernization and would provide full secondary treatment of 307 mgd, 387 mgd, and 397 mgd, respectively, at HTP. For the 307 mgd project, construction would occur during the years 1977 through 1982 with a total of approximately 2,994 manyears of direct labor required. Implementation of the 307 mgd project would utilize space on the HTP site but extensive

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Table VIII-1. Summary of construction and O&M dates for elements of major alternatives.

PROJECT	NO PROJECT		B4C		C3		CX		E2	
	CONSTR.	O&M	CONSTR.	O&M	CONSTR.	O&M	CONSTR.	O&M	CONSTR.	O&M
HTP Secondary Conversion (307 mgd)	-	-	77-82	82-2000	-	-	-	-	78-82	82-2000
HTP Flexibility to Lower Capacity	-	-	-	-	-	-	-	-	1977	82-2000
HTP Secondary Conversion (397 mgd)	-	-	-	-	77-82	72-2000	-	-	-	-
HTP Secondary Conversion (387 mgd)	-	-	-	-	-	-	77-82	82-2000	-	-
HTP Modernization (+ up to 200 mgd secondary)	77-82	82-2000	-	-	-	-	-	-	-	-
HTP Interim Sludge Processing and Disposal	-	-	1978-80	80-97	1978-80	80-97	1978-80	80-97	1978-80	80-97
Sepulveda Plant (40 mgd)	-	-	77-80	79-2000	-	-	-	-	77-80	79-2000
Sepulveda Plant (30 mgd Addition)	-	-	79-80	81-2000	-	-	-	-	79-80	81-2000
Sepulveda Plant (15 mgd Addition)	-	-	92-93	94-2000	-	-	-	-	92-93	94-2000
La Cienega Water Reclamation Plant (75 mgd)	-	-	-	-	-	-	-	-	82-85	86-2000
East Valley Interceptor Sewer										
EVIS I	-	-	78-79	80-2000	-	-	-	-	78-79	80-2000
EVIS II	-	-	82-83	84-2000	-	-	-	-	82-83	84-2000
Los Angeles-Glendale (10 mgd Addition)	-	-	88-89	89-2000	-	-	88-89	89-2000	88-89	89-2000
AVORS (85 cfs)	-	-	-	-	77-79	80-2000	-	-	-	-
Griffith Park Reclaimed Water Delivery System (9 mgd)	-	-	77-78	79-2000	77-78	79-2000	77-78	79-2000	77-78	79-2000
Sepulveda Dam Recreation Area Reclaimed Water Delivery System (9 mgd)	-	-	1980	81-2000	-	-	-	-	1980	81-2000
Woodman Ave. Relief Sewer (54 cfs)	-	-	-	-	82-83	84-2000	-	-	-	-
Total Capacity (Secondary or Better)		220		422		417		417		422

Table VIII-2. Summary of some primary economic impacts of construction of wastewater facilities.

ALTERNATIVE	ELEMENT	COST[1]	PRESENT WORTH[2]	CONSTRUCTION LABOR (MANYEARS)	CONSTRUCTION WAGES	CONSTRUCTION[3] JOBS
A1	HTP 200 mgd Secondary + Modern	$121,959,000	$ 96,713,000	2,132	$ 60,980,000	4,000
B4C, E2	HTP 307 mgd Secondary + Modern	171,282,000	139,708,000	2,994	85,641,000	5,000
E2	HTP Conversion Flexibility	10,400,000	9,079,000	182	5,200,000	300
CX	HTP 387 mgd Secondary + Modern	272,500,000	216,896,000	4,764	136,250,000	8,000
C3	HTP 397 mgd Secondary + Modern	287,182,000	228,583,000	5,021	143,591,000	9,000
B4C, C3, CS, E2	HTP Sludge Processing and Disposal	14,007,000	8,045,000	245	7,004,000	400
B4C, E2	Sepulveda Facility 40 mgd	38,356,000	21,759,000	671	19,178,000	1,000
B4C, E2	Sepulveda Facility 30 mgd Addition	21,503,000	15,331,000	376	10,752,000	600
B4C, E2	Sepulveda Facility 15 mgd Addition	11,569,000	3,423,000	202	5,785,000	300
E2	La Cienega WRP 75 mgd	56,189,000	32,338,000	982	28,095,000	2,000
B4C, E2	EVIS I	7,731,000	6,144,000	135	3,866,000	200
B4C, E2	EVIS II	4,604,000	2,793,000	80	2,302,000	100
B4C, CX, E2	L.A.-Glendale WRP 10 mgd Addition	5,937,000	2,432,000	104	2,969,000	200
C3	AVORS (85 cfs)	42,377,000	35,096,000	741	21,189,000	1,000
B4C, C3, CX, E2	Griffith Park Recl. Water Delivery System	819,000	706,000	14	410,000	20
B4C, E2	Sepulveda Recreation Area Recl. Water System	758,000	540,000	13	379,000	20
C3	Woodman Avenue Relief Sewer	2,672,000	1,621,000	47	1,336,000	80

[1] 1975 estimated dollar cost.

[2] Future (1975 level) costs discounted using 7 percent present worth rate.

[3] Differs from manyears of employment to account for less than full-time employment per individual on job:
Full-time = 2,112 manhours per year

Table VIII-3. Summary of primary economic impacts of construction by selected alternatives.

	NO PROJECT	B4C	C3	CX	E2
Total Cost	$121,959,000	$276,566,000	$347,057,000	$293,263,000	$343,155,000
Present Worth	96,713,000	200,881,000	274,051,000	228,079,000	242,298,000
Direct Payroll	60,980,000	138,286,000	173,530,000	146,633,000	171,581,000
Direct Man-Years	2,132	4,834	6,068	5,127	5,998

grading would be required. Construction costs (in 1975 dollars) would be approximately $171,282,000.

Existing operation of HTP would be changed substantially during the construction phase, and would include almost 3 years of discharging primary effluent only through the 5-mile outfall, about 1 month of discharging mixed liquor through the 5-mile outfall, and less than 1 month of discharging secondary effluent through the 1-mile outfall. Shorter duration interruptions are also anticipated.

For the 387 mgd and 397 mgd projects, expansion for secondary treatment might require the use of on-site land which would have to be developed by constructing a large retaining wall and filling behind it. Construction periods would be from 1978 through 1982. For the 397 mgd alternative, labor requirements would be approximately 5,021 man-years. Construction costs would be $287,182,000. For the 387 mgd alternative, construction labor requirements and costs would be approximately 95 percent of the requirements for the 397 mgd unit. The construction impact discussion for HTP will not distinguish between the 387 mgd and 397 mgd alternatives.

Accompanying the E2 maximum water reclamation alternative, is a $10,400,000 project - performed in 1977 - to provide conversion flexibility to HTP for the later change when the La Cienega Water Reclamation Plant commences operations. Following initiation of 75 mgd of treatment at La Cienega, HTP capacity would be reduced from 307 to 232 mgd. This construction effort would require 182 man-years of direct labor.

b. Impacts on Physical Elements of the Environment.

(1) SOILS AND TOPOGRAPHY. All alternative HTP projects will require considerable grading and removal of soil (mainly sand) from the HTP site. Phase I construction will be included in all alternatives and will require removal of 210,000 cubic yards of material for construction of the new primary tanks. Phase II and III construction apply to the 307 mgd alternative and would require removal of approximately an additional

1,300,000 cubic yards of material. Excavation for the 397 mgd alternative has not been estimated, but some soil that would otherwise be removed from the site probably would be used for fill behind the retaining wall. No plans have been made for the disposal of material to be removed from the site, but L.A. International Airport has been suggested, as have County Beaches, where extra sand is needed for rehabilitation.

Most earth work would occur at the south end of the plant site, where the existing hill would be carved out to provide a lower, flat surface for construction of new facilities. The extensive earth-moving operations could lead to problems of erosion and fugitive dust, both at the HTP site and at the soil disposal location. Soil would also blow from trucks in transit.

(2) HYDROLOGY AND WATER QUALITY. Water will be used during construction for settling dust, washing equipment, and mixing concrete. The quantities, sources, and disposal of these waters have not been determined. Most runoff from graded areas would be toward the site, and water would percolate rapidly into the sandy soil. There are no nearby uses of groundwater which would be affected by construction activities.

Effluent quality will be reduced during the construction phases of modernizing HTP under the No Project Alternative (to be mostly completed by 1978) and converting HTP to full secondary treatment in the other alternatives (to be completed about July 1981) (CLA, 1976). For modernization, approximately two of the existing primary tanks will be out of service at one time while they are renovated. The adverse effects on the marine environment, resulting from this interruption of service, will be addressed in an amendment to the City's EIR for this project. Secondary treatment will be removed during this project so that construction phase impacts on effluent quality of the No Project Alternative will be the same as those of projects including full secondary treatment. The existing 100 mgd of secondary treatment will be removed for a period of approximately 3 years.

Installation of the eductor pump system will necessitate discharging all effluent from the 1-mile outfall for a period of approximately 2 to 3 weeks. The effluent, which will be chlorinated at this time, is expected to introduce chloramines and other chloro-derivatives into the marine ecosystem, along with the other wastewater constituents such as viruses and bacteria. The short duration of this discharge will preclude any lasting effects on the near-shore water quality of Santa Monica Bay.

The alternatives for upgrading HTP to full secondary treatment involve a degradation of effluent quality that will result from reduced treatment capabilities, including shutdown of primary tanks and the termination of secondary treatment. Storm flows may also lower the effluent quality when the secondary treatment system is out of service. Figure VIII-1 shows the changes in effluent quality expected during the 3 to 4 years of construction.

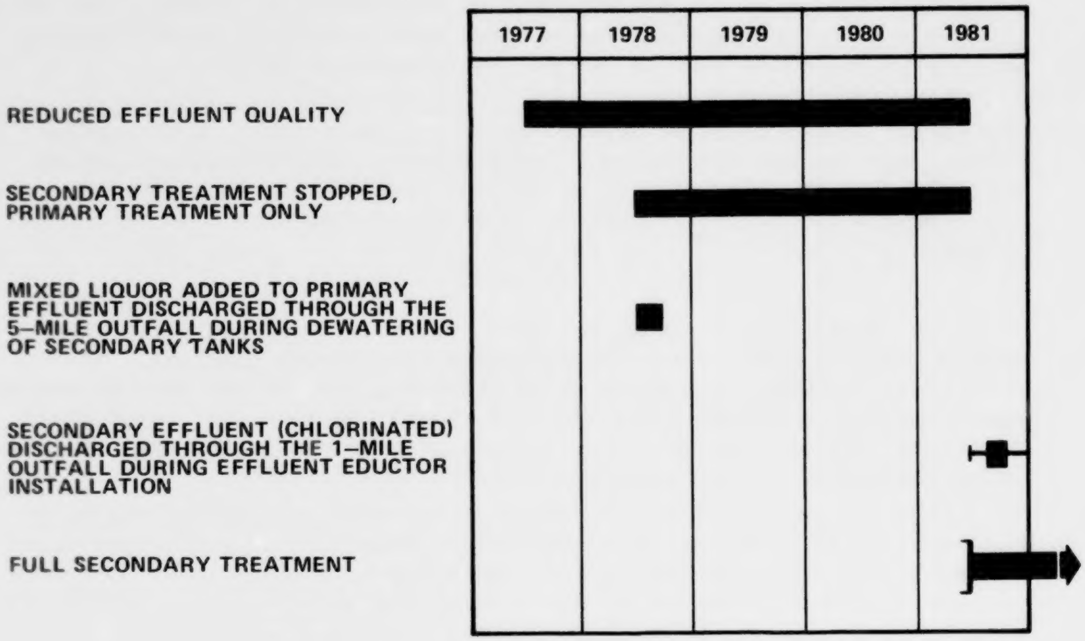

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Figure VIII-1. Changes in effluent quality during the construction phases of converting Hyperion Treatment Plant to full secondary treatment (from DPW, 1976, and CLA, 1976).

The present chlorination facilities will remain in operation during construction until the new facilities are completed. Thus, irrigation water for the grounds of HTP and discharges from the 1-mile outfall can continue to be chlorinated (5- and 7-mile effluents are not chlorinated). The secondary treatment system will be taken out of service in mid-1978 and remain out until the project is completed (about July 1981). During dewatering of the secondary tanks, mixed liquor (activated sludge plus wastewater in the activated sludge treatment process) will be discharged from the 5-mile outfall along with primary effluent for a period of two to three weeks (DPW, 1976). The mixed liquor may be discharged out of the 7-mile outfall, although this would require a longer dewatering period because of the smaller capacity of the 7-mile pipe.

After closure of the secondary treatment system, storm flows may exceed the capacity of the primary effluent diversion conduit resulting in a diversion of part of the flows to the West Primary Tanks which have an effluent conduit capable of conveying the additional flow to the pump plant (DPW, 1975b). This practice would reduce the efficiency of the West Primary Tanks treatment process considerably. The resulting lower quality effluent will probably be discharged from the 5-mile outfall. However, if high flows in conjunction with high tides exceed the pump capacity, part of the effluent would be discharged from the 1-mile outfall.

The pump plant and 5-mile outfall will be out of service during construction of the effluent eductor main chamber (estimated 72 hours) and the primary effluent bypass (estimated 24 hours). These are scheduled after full secondary treatment is operational so that only chlorinated secondary effluent will be discharged from the 1-mile outfall for approximately 2 to 3 weeks during construction (DPW, 1976).

In summary, the potential impacts to the ocean environment during the construction phase will result from:

- Loss of secondary treatment for 3 years and consequent increase in release of nutrients and toxicants.
- Release of the activated sludge presently in the system through either the 7-mile or the 5-mile outfall, requiring less than 1 month.
- Potential degradation of the primary effluent quality through the 5-mile outfall during storm flows because of the reduced HTP capacity.
- Discharge of all secondary chlorinated effluent through the 1-mile outfall for approximately 2 to 3 weeks during construction of effluent eductor.

The following discussions of the construction impacts predicted to occur during the upgrading of HTP to full secondary treatment apply to all of the alternatives. However, the mass emissions of sewage constituents from the present 360 mgd operations will be reduced by a small amount in Alternatives B4C and E2 when SWRP is completed in 1980.

(a) Impacts of Discharging Primary Effluent. The present (1974) effluent (mixed primary and secondary) and primary effluent characteristics are shown in Table VIII-4. The percentage increase in constituent concentrations resulting from discharging only primary effluent are also shown on this table. Constituents such as phenols, nitrite nitrogen, manganese, and arsenic will remain unchanged while nitrite nitrogen will be decreased. Concentrations of the other constituents will be increased from 8 to 100 percent, and the concentration of total coliform bacteria and viruses discharged in primary effluent alone will exceed those discharged at present. The effects on the physical and chemical ocean environment will result not only from increased concentrations of most constituents but also from increased sedimentation resulting from the higher settleable solids load. With the exception of total coliform bacteria, turbidity, and possibly oil and grease on the surface, the concentration of wastewater constituents (after initial dilution) is not expected to measurably increase in the water column near the outfall. The environmental load of these constituents, however, will increase as a result of the higher mass emissions rates.

(b) Discharge of Mixed Liquor. Much of the information necessary for a detailed analysis of the impacts resulting from discharge of activated sludge and mixed liquor from the existing secondary tanks was not available for this report. The composition of the activated sludge is not reported nor has the mass emission rate during the proposed discharge been established. However, approximately half of the sludge currently discharged through the 7-mile outfall is activated sludge from the secondary process that has been anaerobically digested, so that dewatering through the 7-mile outfall might be accomplished with little change from the existing sludge discharge in either mass emission rate or composition.

If, as is proposed, the secondary mixed liquor is discharged through the 5-mile outfall, the potential for new impacts is much greater. There will be an increase in the concentration and mass emission rate of most wastewater constituents in the 5-mile effluent. The discharged sludge will be mixed with the existing 360 mgd of treated wastewater, diluting it greatly, and at this time, the expected concentrations are not known. The increased solids will probably increase the sedimentation rate for some distance around the outfall, and thus, the concentration of toxicants in the sediments since most toxicants are associated with sludge particulates. Bacterial concentrations will be increased in the effluent and especially on the particulates since activated sludge is a bacterial culture. These bacteria should die within a few weeks as a result of the lower (relative to effluent) temperature and increased pressure at the depth of the outfall. Predation by other microorganisms may also be a factor in decreasing the number of sludge bacteria. Since most of the bacteria are associated with the sludge particles, no large increase in bacterial counts in the water column is expected. The short duration of mixed liquor discharge (2 to 4 weeks) probably will not result in lasting effects on the sediment or water quality.

Table VIII-4. Effluent characteristics for the present HTP 5-mile wastewater discharge and primary effluent based on 1974 data. The percent increase in constituent concentrations if only primary effluent is discharged is also shown (data from DPW, 1975a).

PARAMETER	CONCENTRATION (mg/l)		PERCENT INCREASE IN PRIMARY
	5-MILE EFFLUENT	PRIMARY EFFLUENT	
COD	250	318	27
BOD	121	171	41
TSS	83	103	24
TDS	870[2]	940	8
TS	953[2]	1,043	9
pH[1]	7.3	7.2	-
Oil and Grease	18	29	61
Phenol	0.06	0.06	0
Detergent (MBAS)	5.1	7.7	51
Organic N	6.3	7.9	25
NO_2-N	0.0	0.0	0
NO_3-N	0.3	0.2	33[3]
NH_4-N	13.8	15.8	15
SiO_2	19.1[2]	20.0	5
PO_4	24.4	31.7	30
Cyanide	0.20	0.28	40
Aluminum	0.55[2]	0.68	24
Copper	0.19	0.22	16
Zinc	0.24	0.34	42
Iron	0.64	0.69	8
Nickel	0.18	0.20	11
Lead	0.04	0.05	25
Arsenic	0.01	0.01	0
Cadmium	0.02	0.03	50
Hexavalent Chromium	0.00	0.00	0
Trivalent Chromium	0.21	0.27	29
Manganese	0.02	0.02	0
Selenium	0.02	0.04	100
Mercury	0.0032	0.0041	28
Silver	0.02	0.03	50
Total Identifiable Chlorinated Hydrocarbons	0.0014	0.0017	21

[1] pH has no units.

[2] Calculated value.

[3] Negative number indicates a decrease.

(c) Impacts of Reduced Primary Effluent Quality During Storm Flows. The potential degradation of primary effluent quality at the 5-mile outfall during storm flows will result from an increase in the volume of the influent to HTP because of infiltration and inflow of surface and subsurface waters into the sewer system. Increased influent volume will result in decreased retention and treatment time within HTP, and hence an increase in the mass emissions through the 5-mile outfall of toxic substances that are normally concentrated in the sludge, of organic material that would ordinarily be removed from the system by conversion to gas in the anaerobic digesters, and of total settleable solids that do not have time to settle out. Because the effluent will be more diluted as a result of the storm flows, the concentrations of these substances are not likely to be as great as they are under normal flow conditions, although the effluent plume will be larger and more widespread. Increased organic content, suspended solids, and settleable solids in the plume are likely to have as their main effect a transient increase in turbidity. The increased mass emissions of toxic substances will increase the quantities of these substances in the water column; however, the increases are expected to be small, and the effects undetectable.

Any potential impact of 5-mile effluent on the shoreline during storm flows is likely to be heavily overshadowed by surface runoff which contains most of the constituents of municipal sewage.

(d) Impacts of Discharging Secondary Effluent Through the 1-Mile Outfall. The 1-mile outfall was taken out of service in the early 1960's when the 5-mile pipe was completed; however, it is maintained in a standby condition by discharging chlorinated secondary effluent for 3 hours once a week at a rate of 100 mgd. During the latter part of the construction activities, all of the secondary effluent will be released from the 1-mile outfall for approximately 2 to 3 weeks. The impacts will result from an effluent plume which will probably transiently increase the concentrations of toxicants, total coliform bacteria and viruses along the beaches of Santa Monica Bay. The effluent is to be chlorinated prior to release so that bacterial contamination will probably be minor although this process will produce chloramines and chloroderivatives. Samples taken during discharge from the 1-mile outfall have shown that the total coliform bacterial counts remain well below the State standard of 1,000 MPN/100 ml within 0.5 km of the outfall (SCCWRP, 1975a).

(3) AIR RESOURCES. Air quality will be adversely affected during construction due to vehicle emissions, dust generation, and temporary releases of sewage odors. In addition to the dust generated during earth-moving, demolition is expected to cause increases in particulates. This impact is expected for all three alternatives.

Over 80,000 truck trips would be required to remove 1,500,000 cubic yards of soil from the site. Since the truck destinations are not known, vehicle miles and emissions cannot be calculated accurately but they will be important impacts. Also, truck traffic on nearby roads can be expected to cause some delays to other traffic, thereby causing further increases in vehicular emissions. The No Project Alternative would require only about 15 percent of the truck trips needed for the 307 mgd alternative. For the 397 mgd alternative, some of the 80,000 truck trips would probably be short on-site trips. Construction workers' vehicles (an average of 860 per day) would also contribute to emissions in the area. Odors will occur during repair work on the digesters and primary tanks. This work would be done under each of the project alternatives and the No Project Alternative.

Table VIII-5 provides a rough estimate of the air pollutants that would probably be generated during the construction of the 307 mgd HTP alternative. Morning, daytime and evening winds are predominantly from the ocean and can be expected to move odors and other air pollutants into the residential neighborhood to the east of the site. Peak dispersion will occur near mid-day when the yearly average wind speed is approximately 12 mph. Morning and evening winds average approximately 5 mph and would probably cause less dispersion of odors. Midnight to early morning winds generally will blow odors offshore. During the winter, velocities are higher than the average, and winds blow in more erratic directions. Greater dispersion of odors will probably make them less noticeable. Occasional winds blowing contrary to the average directions described above may spread odors along the beach.

Table VIII-5. Estimated air pollutant emissions during construction of HTP 307 mgd Alternative (CLA, 1976).

Particulates Pounds/day	25-70
Sulfur Oxides Pounds/day	20-120
Carbon Monoxide Pounds/day	600-2,700
Hydrocarbons Pounds/day	24,000-39,000*
Nitrogen Oxide Pounds/day	575-1,925

* Digester Gas Leakage 1 - 1.5 X 10^6 FT^3/day

(4) NOISE AND VIBRATION. Construction traffic and demolition will be major sources of noise and vibration. Noise levels expected from different types of construction equipment and activities are shown on Table VIII-6.

Table VIII-6. Typical noise levels from construction equipment.

dBA RANGE AT 50 FEET	
Jack Hammer	88-98
Dozer	82-95
Backfiller	82-95
Truck with Lowboy	82-92
Backhoe	80-92
Sideboom	78-92
Air Compressor	85-91
Motor Crane	78-87
Flat Bed Truck	84-87
Welding Rigs	72-82
Pickup	70-85
Auto	65-76

c. Impacts on Biological Elements of the Environment.

(1) TERRESTRIAL RESOURCES. Construction of the HTP 307 mgd alternative will require grading and earth removal to create 772,000 square feet of buildable flat land. The majority of this will be at the south end of the site where a sprinkler system supports lush growth of weedy species - some native and many ornamentals. Vegetation in this area will be completely eliminated during construction, but the new slopes created by the project can be revegetated with a similar type of growth if this is considered desirable. Some lawn and ornamental plantings near buildings will also be disrupted during construction. Most of the on-site habitat presently utilized by a large variety of birds would be eliminated or heavily disturbed during construction. Small mammals and reptiles inhabiting the site would also be displaced or destroyed during construction.

No significant biological resources were identified on the HTP site and none would be disturbed during construction. The endangered El Segundo blue butterfly (*Shijimiaeoides battoides allyni*) utilizes *Eriogonum parvifolium* as a food plant. Both the butterfly and the shrub are found nearby, but neither was found on the HTP site during a one-day search. The coastal strand habitat on adjacent airport property is considered by the county to be an ecologically significant area. It is also the largest remaining area of habitat for the El Segundo blue. This site would not be seriously disrupted during HTP construction but background noise levels and air pollutants would increase, especially during daylight hours. Peak noise levels would still be due to aircraft rather than construction. Air pollutants and noise due to construction are not expected to have any noticeable effects on biological resources of the airport dunes.

The No Project Alternative would disturb less on-site habitat than either the 307 or 397 mgd alternative.

(2) AQUATIC RESOURCES. There are no fresh water resources adjacent to the HTP site that would be subject to potential pollution from runoff or other impacts of construction. All anticipated primary impacts on aquatic resources will be to the marine ecosystem as a result of changes in present discharges from HTP. Expected quality of effluents were described in Section VIII.A.1.(b).(2). This section discusses impacts of these effluents on the marine biota.

(a) Impacts of Toxicant Increases. There are two major types of biological effects that occur as a result of increased concentration and mass emissions of toxic substances in the 5-mile effluent during construction. One is the possibility of direct toxic effects to organisms exposed to the undiluted effluent, and the second is the potential for increased bioaccumulation in organisms and biomagnification through the food web of these substances.

The effluent dilutes rapidly as it leaves the discharge ports of the 5-mile outfall diffuser arms. But, because organisms live in the immediate vicinity of and on the diffuser arms, some are undoubtedly exposed to the undiluted effluent. Tables VIII-7 and VIII-8 compare the concentrations of metals and other toxic compounds in the existing 5-mile effluent and in effluent receiving only primary treatment and list anticipated direct toxic effects to algae, invertebrates, and fish. Reversion to primary treatment will result in increased concentrations of toxicants so that the direct toxic effects that now occur would be expected to occur over a wider area as the effluent is diluted, and in the immediate vicinity of the outfall, direct toxicity may occur to organisms whose toxicity threshold had not been exceeded previously. Whether or not direct toxic effects presently occur, however, is not known.

Surprisingly, there have been no studies of the bioaccumulation of wastewater constituents by benthic organisms living on the outfall structures. The experiments conducted by SCCWRP in which mesh bags of mussels were suspended in the water column several km away from the 5-mile outfall (1 km away from the 7-mile outfall) indicate that chlorinated hydrocarbons in the water column are accumulated from areas of low concentration (see Chapter III). The organisms living on the 5-mile outfall pipe near the discharge ports are exposed to the highest concentrations of wastewater constituents, and thus, are most likely to accumulate these substances if such accumulation is taking place. The only data which show uptake of toxic substances by benthic infauna near the HTP outfalls are for invertebrates in the surrounding sediments and are shown in Figures VIII-2 and VIII-3 (identical to Figure III-C-31 and III-C-32). These show that the uptake of metals by organisms living in the sediments is not highest near the end of the 7-mile sludge outfall as might be expected, but is more clearly related to proximity to the 5-mile outfall. These data are suspect, however, since the concentration measured may be in the sediments ingested by the organisms rather than their tissues.

(b) Impacts of Nutrient Alterations. Figure VIII-4 compares the inorganic and organic nitrogen inputs in the effluent from the HTP 5-mile outfall during 1974 (mixed primary and secondary effluent) and the construction phase of conversion to full secondary treatment when all effluent will receive only primary (1°) treatment. Figure VIII-4 also shows the potential changes in the fishery resulting from discharging only primary effluent and may be compared with Figure III-C-37. The temporary reversion to full primary treatment could potentially result in the fish production attributable to HTP being increased by 22 percent over 1974 levels. The increase is equivalent to 296 metric tons of piscivorous fish (0.3 percent of the total 1972 commercial catch, excluding

Table VIII-7. Comparison of constituents measured in HTP wastewater with marine algae and invertebrate bioassays reported in the literature. Potential effects of the various effluent treatments are designated in the bioassay column by effluent column superscripts.

CONSTITUENT	CONCENTRATION (mg/l = ppm)					TAXA	EFFECT	REFERENCES
	A 5-MILE EFFLUENT[1]	B 7-MILE EFFLUENT[1]	C PRIMARY TREATMENT[2]	D SECONDARY TREATMENT[3]	BIOASSAY[4]			
DDT	0.00072	0.00259	-[5]	-[5]	>10.0	European Cockle, *Cardium edule*	48-hr LC_{50}	SCCWRP, 1973
					>10.0	Quahog clams, *Mercenaria mercenaria*	96-hr LC_{50}	SCCWRP, 1973
					10.0	Mud Snail *Nassa obsoleta*	96-hr LC_{50}	SCCWRP, 1973
					1.0	Oyster adults, *Crassostrea virginica*	90% decrease in growth, 3-4 days	SCCWRP, 1973
					0.034	Oyster larvae, *Crassostrea virginica*	14-day LC_{50}	SCCWRP, 1973
					0.025	Oyster adults, *Crassostrea virginica*	50% decrease in growth, 12 days	SCCWRP, 1973
					0.010	Phytoplankton	Inhibited growth	SCCWRP, 1973
					0.010-0.003	European brown Shrimp, *Crangon crangon*	48-hr LC_{50}	SCCWRP, 1973
					0.006	Hermit crab, *Pagurus longicarpus*	48-hr LC_{50}	SCCWRP, 1973
					0.0051	Grass shrimp, *Palaemonetes vulgaris*	48-hr LC_{50}	SCCWRP, 1973
					0.0050	Crab larvae, *Cancer magister & C. productus*	72-hr LC_{100}	SCCWRP, 1973
					0.002^{B}	Quahog clams, *Mercenaria mercenaria*	Inhibited glycolytic and glucogenic enzyme activity	SCCWRP, 1973
					0.001^{B}	Oyster adults, *Crassostrea virginica*	20% decrease in shell deposition and growth	SCCWRP, 1973
					0.001^{B}	Sand shrimp, *Crangon septemspinosa*	48-hr LC_{50}	SCCWRP, 1973
					0.00012^{AB}	Shrimp	28-day LC_{100}	SCCWRP, 1973
					0.0001^{AB}	Penaeid shrimp, *Penaeus aztecus*	Caused abnormal tactile & chemoreceptor responses	SCCWRP, 1975b
					0.00005^{AB}	Pink shrimp, *Penaeus duorarum*	Inhibited enzyme activity	SCCWRP, 1975b
					0.00001^{AB}	Copepod larvae, *Pseudodiaptomus sp.*	Inhibited development	SCCWRP, 1975b
Endosulfan	-[5]	-[5]	-[5]	-[5]	0.450	Bay mussel, *Mytilus edulis*	50% reduction in byssal thread formation at 15°C in 24 hours	Roberts, 1975
					0.800	Queen scallop, *Chlamys operularis*	50% reduction in byssal thread formation at 15°C in 24 hours	Roberts, 1975
Trichlorphon	-[5]	-[5]	-[5]	-[5]	30	Bay mussel, *Mytilus edulis*	50% reduction in byssal thread formation at 15°C in 24 hours	Roberts, 1975
PCB's	0.00036[6]	0.0033[6]	-[5]	-[5]	>10 - 3	European cockle, *Cardium edule*	48-hr LC_{50}	SCCWRP, 1973
					>10 - 0.3	European brown shrimp, *Crangon crangon*	48-hr LC_{50}	SCCWRP, 1973
					0.1	Juvenile pink shrimp, *Penaeus duorarum*	48-hr LC_{100}	SCCWRP, 1973
					0.005	Juvenile pink shrimp, *Penaeus duorarum*	20-day LC_{72}	SCCWRP, 1973
					0.003^{B}	Invertebrates	Caused hepatopancreatic cellular alterations	SCCWRP, 1975b
					0.001^{B}	Invertebrates	Caused brachial necrosis alterations	SCCWRP, 1975b

Table VIII-7. (Cont.)

CONSTITUENT	CONCENTRATION (mg/l = ppm)					TAXA	EFFECT	REFERENCES
	A 5-MILE EFFLUENT[1]	B 7-MILE EFFLUENT[1]	C PRIMARY TREATMENT[2]	D SECONDARY TREATMENT[3]	BIOASSAY[4]			
PCB's	0.0036[6]	0.0033[6]	-[5]	-[5]	0.001^{B}	Oysters	Decreased shell growth 20%	SCCWRP, 1973
Aroclor 1242					0.9	Bay mussel, *Mytilus edulis*	50% reduction in byssal thread formation at 15°C in 24 hours	Roberts, 1975
Arcolor 1254					2.2	Bay mussel, *Mytilus edulis*	50% reduction in byssal thread formation at 15°C in 24 hours	Roberts, 1975
					0.0001	Diatoms, *Rhizosolenia setigera and*	Reduced growth	SCCWRP, 1975b
					0.0001	Diatoms, *Thalassiosira pseudonana*	Reduced growth	SCCWRP, 1975b
					0.0001	Green alga, *Dunaliella tertiolecta*	Reduced growth	SCCWRP, 1975b
Hg^{+2}	0.0032	0.154	0.0041	0.0024	180	Oyster larvae, *Crassostrea commercialis*	2-hr LC_{50}	SCCWRP, 1973
					13	Bay mussel larvae, *Mytilus edulis*	2-hr LC_{50}	SCCWRP, 1973
					10	Oysters	Heavy mortality after 3 days	Fowler, et al., 1975
					10	Clams	Heavy mortality after 5 to 7 days	Fowler, et al., 1975
					10-3.3	European brown shrimp, *Crangon crangon*	48-hr LC_{50}	SCCWRP, 1973
					10-3.3	European cockle, *Cardium edule*	48-hr LC_{50}	SCCWRP, 1973
					1.04	Polychaete, *Mercierella enigmatica*	Modified sublethal response	SCCWRP, 1973
					1.0	Polychaete, *Ophryotrocha labronica*	0.5-hr LC_{50}	Oshida, et al., 1976
					0.5	Bay mussel, *Mytilus eclulis*	Modified sublethal response	SCCWRP, 1973
					0.14^{B}	Tubeworm larvae, *Spirobis*	2-hr LC_{50}	SCCWRP, 1973
					0.10^{B}	Bryozoan larvae, *Matersipora*	2-hr LC_{50}	SCCWRP, 1973
					0.10^{B}	Polychaete adults, *Capitella capitata*	96-hr LC_{50}	Oshida, et al., 1976
					0.10^{B}	Polychaete adults, *Capitella capitata*	28-day LC_{50}	Oshida, et al., 1976
					0.10^{B}	Polychaete juveniles, *Neanthes arenaceodentata*	96-hr LC_{50}	Oshida, et al., 1976
					0.10^{B}	Isopod, *Idotea emarginata*	LC_{50} >5 days	Jones, 1973
					0.10^{B}	Isopod, *Idotea neglecta*	LC_{50} >5 days	Jones, 1973
					0.09^{B}	Polychaete juveniles, *Neanthes arenaceodentata*	28-day LC_{50}	Oshida, et al., 1976
					0.032^{B}	Bay mussel embryos, *Mytilus*	Abnormal development	Oshida, et al., 1976
					0.032^{B}	Oyster, *Crassostrea*	Abnormal development	SCCWRP, 1973
					0.022^{B}	Polychaete adults, *Neanthes arenaceodentata*	96-hr LC_{50}	Oshida, et al., 1976
					0.017^{B}	Polychaete adults, *Neanthes arenaceodentata*	28-day LC_{50}	Oshida, et al., 1976

Table VIII-7.(Cont.)

CONSTITUENT	CONCENTRATION (mg/1 = ppm)					TAXA	EFFECT	REFERENCES
	A 5-MILE EFFLUENT^1	B 7-MILE EFFLUENT^1	C PRIMARY TREATMENT^2	D SECONDARY TREATMENT^3	BIOASSAY^4			
Hg^{+2} (cont)	0.0032	0.154	0.0041	0.0024	0.014^D	Polychoete trochophore larvae, *Capitella capitata*	96-hr LC$_{50}$	Oshida, et al., 1976
					0.010^C	Invertebrates	Increased respiration	SCCWRP, 1975b
					0.005^B	Protozean, *Christigera*	Caused 12% growth retardation	Gray and Ventilla,1973
					0.003^{ABC}	Isopod, *Sphaeroma pentodon*	Induced morphological changes	SCCWRP, 1975b
					0.002-0.0015^{ABCD}	Sea urchin embryos, *Paracentrotus*	Abnormal development	SCCWRP, 1973
Ag^{+1}	0.02	0.04	0.03	0.019	0.4	Barnacle	48-hr LC$_{50}$	SCCWRP, 1973
					0.00016^{ABCD}	Sea urchin embryo, *Paracentrotus*	Abnormal development	SCCWRP, 1973
Zn^{+2}	0.24	23.9	0.34	0.23	330-100	European brown shrimp, *Crangon crangon*	48-hr LC$_{50}$	SCCWRP, 1973
					330-100	European Cockle, *Cardium edule*	48-hr LC$_{50}$	SCCWRP, 1973
					100	Oyster adult, *Ostrea edulis*	96-hr LC$_{50}$	SCCWRP, 1973
					30	Barnacle adult, *Balanus balanoides*	90% kill in 2 days	Becker & Thatcher,1973
					10^B	Giant kelp, *Macrocystis pyrifera*	50% inhibition of photosynthesis in 4 days	Becker & Thatcher,1973
					8^B	Barnacle adult, *Balanus balanoides*	90% kill in 5 days	Becker & Thatcher,1973
					5.2^B	Bryozoan larvae, *Bugula*	2-hr LC$_{50}$	SCCWRP, 1973
					4.9^B	Tubeworm larvae, *Spirorbis*	2-hr LC$_{50}$	SCCWRP, 1973
					3.5^B	Polychaete adult, *Capitella capitata*	96-hr LC$_{50}$	Oshida, et al., 1976
					3.2^B	Osyter embryos, *Crassotrea*	Abnormal development	SCCWRP, 1973
					1.8^B	Polyechaete adult, *Neanthes arenaceodentata*	96-hr LC$_{50}$	Oshida, et al., 1976
					1.7^B	Polychaete trochophore larvae, *Capitella capitata*	96-hr LC$_{50}$	Oshida, et al., 1976
					1.4^B	Polychaete adult, *Neanthes arenaceodentata*	28-day LC$_{50}$	Oshida, et al., 1976
					1.25^B	Polychaete adult, *Capitella capitata*	28-day LC$_{50}$	Oshida, et al., 1976
					1.0^B	Polychaete adult, *Ophryotrocha labronica*	13-hr LC$_{50}$	Oshida, et al., 1976
					1.0^B	Mussel embryos, *Mytilus edulis*	Abnormal development	SCCWRP, 1973
					~1.0^B	Oyster larvae, *Ostrea eclulis*	96-hr LC$_{50}$	SCCWRP, 1973
					0.9^B	Polychaete juveniles, *Neanthes arenaceodentata*	96-hr LC$_{50}$	Oshida, et al., 1976
					0.32^{BC}	Sea urchin eggs, *Anthocidaris sp.*	Abnormal development 27C	Becker & Thatcher,1973

Table VIII-7. (Cont.)

CONSTITUENT	CONCENTRATION (mg/l = ppm)					TAXA	EFFECT	REFERENCES
	A 5-MILE EFFLUENT[1]	B 7-MILE EFFLUENT[2]	C PRIMARY TREATMENT[2]	D SECONDARY TREATMENT[3]	BIOASSAY[4]			
Zn^{+2} (cont)	0.24	23.9	0.34	0.23	0.32^{BC}	Pacific oyster egg, *Crassostrea gigas*	Abnormal development, 27C	Becker & Thatcher,1973
					0.25^{BC}	Diatom, *Nitzschia closterium*	Division rate reduced	Becker & Thatcher,1973
					0.25^{BC}	Protozoan, *Christigera*	ILm (median inhibitory level, 1/2 control growth rate)	Gray and Ventilla,1973
					0.16^{ABCD}	Sea urchin egg, *Psammechinus miliaris*	Abnormal fertilization and cleavage	Becker & Thatcher,1973
					0.03^{ABCD}	Sea urchin larvae, *Paracentrotus lividus*	Growth retarded	Becker & Thatcher,1973
Cu^{+2}	0.19*	13.9	0.22	0.11	200-50	Barnacle, *Elminius modestus*	2-5 hr LC_{50} @pH 8.1, 21-25C	Becker & Thatcher,1973
					50-15	Barnacle, *Elminius modestus*	2-25 hr LC_{50} @pH 8.1, 21-25C	Becker & Thatcher,1973
					33-10	European brown shrimp, *Crangon crangon*	48-hr LC_{50}	SCCWRP, 1973
					30.0	Barnacle nauplii, *Balanus crenatus*	Killed in 2 hrs	Becker & Thatcher,1973
					30.0	Barnacle nauplii, *Balanus balanoides*	Killed in 2 hrs	Becker & Thatcher,1973
					22.2	Bay mussel, *Mytilus edulis*	2-hr LC_{50}	SCCWRP, 1973
					20.0	Barnacle larvae, *Elminius modestus*	10-hr LC_{50}	SCCWRP, 1973
					10.0^{B}	Barnacle adults, *Balanus crenatus*	Killed in 2 hrs	Becker & Thatcher,1973
					10.0^{B}	Barnacle adults, *Balanus balanoides*	Killed in 2 hrs	Becker & Thatcher,1973
					$8-2.5^{B}$	Copepod, *Acartia clausi*	2-3 hr LC_{50}	Becker & Thatcher,1973
					4.9^{B}	Barnacle cyprids	Lethal, 1 day	Becher & Thatcher,1973
					$2.5-1.0^{B}$	Copepod, *Acartia clausi*	3-14 hr LC_{50}	Becker & Thatcher,1973
					$2.0-1.0^{B}$	Shore crab, *Carcinus maenas*	Threshold toxicity, 11-12 days	Becker & Thatcher,1973
					1.9^{B}	Pacific oyster, *Crassostrea gigas*	96-hr LC_{50}	Becher & Thatcher,1973
					1.5^{B}	Polychaete, *Nereis virens*	Killed in 2-3 days	Becker & Thatcher,1973
					1.3^{B}	Phytoplankton	K^{+} loss and membrane damage	SCCWRP, 1976
					1.0^{B}	European cockle, *Cardium edule*	48-hr LC_{50}	SCCWRP, 1973
					0.8^{B}	American oyster larvae	Lethality	SCCWRP, 1973
					0.57^{B}	Bryozoan larvae, *Watersipora*	2-hr LC_{50}	SCCWRP, 1973
					0.51^{B}	Tubeworm larvae, *Spirorbis*	2-hr LC_{50}	SCCWRP, 1973
					0.5^{B}	Polychaete, *Nereis virens*	Killed in 4 days	Becker & Thatcher,1973
					0.5^{B}	Barnacle cyprids	Inactive after 24 hrs	SCCWRP, 1973

Table VIII-7. (Cont.)

CONSTITUENT	CONCENTRATION (mg/l = ppm)					TAXA	EFFECT	REFERENCES
	A 5-MILE EFFLUENT[1]	B 7-MILE EFFLUENT[2]	C PRIMARY TREATMENT[2]	D SECONDARY TREATMENT[3]	BIOASSAY[4]			
Cu^{+2} (cont)	0.19	13.9	0.22	0.05	$< 0.5^{B}$	Prawn, *Leander squilla*	Toxcity threshold	SCCWRP, 1973
					$0.5-0.33^{B}$	European brown shrimp, *Crangon cragon*	Detection and avoidance	SCCWRP, 1973
					$0.5-0.13^{ABC}$	Pacific oyster, *Crassostrea gigas*	Accumulation of Cu, making unfit for food	Becker & Thatcher,1973
					0.32^{B}	Protozoan, *Colpidium comphylum*	ILm	Sudo and Aiba, 1973
					0.32^{B}	Bay mussel, *Mytilus edulis*	1st apparent significant responses	Becker & Thatcher,1973
					0.32^{B}	Polychaete, *Mercierella enigmatica*	1st apparent significant responses	Becker & Thatcher,1973
					$>0.3^{B}$	Bryozoan	No growth	Becker & Thatcher,1973
					$>0.3^{B}$	Bryozoan, *Bugula neritina*	Larvae cannot live	Becker & Thatcher,1973
					0.3^{B}	Polychaete adults and juveniles, *Neanthes arenaceodentata*	96-hr LC_{50}	Oshida, et al., 1976
					$0.3-0.2^{BC}$	Bryozoan, *Bugula neritina*	Growth retarded	Becker & Thatcher,1973
					0.27^{BC}	Protozoan, *Opercularia sp.*	ILm	Sudo and Aiba, 1973
					0.25^{B}	Protozoan, *Vorticella microstoma*	ILm	Sudo and Aiba, 1973
					0.2^{BC}	Bay mussel, *Mytilus edulis*	55% dead, 7 days, 10C threshold toxicity	Becker & Thatcher,1973
					0.2^{BC}	Polychaete adult, *Capitella capitata*	96-hr LC_{50}	Oshida, et al., 1976
					0.2^{BC}	California mussel, *Mutilus californicus*	100% kill, 2 days	Becker & Thatcher,1973
					0.2^{BC}	Bay mussel, *Mytilus edulis*	100% kill, 17 days	Becker & Thatcher,1973
					0.25^{B}	Polychaete adult, *Neanthes arenaceodentata*	28-day LC_{50}	Oshida, et al., 1973
					0.2^{BC}	Mollusc, *Fusinus kobeli*	100% kill, 8 days	Becker & Thatcher,1973
					0.18^{ABC}	Polychaete trochophore larvae, *Capitella capitata*	96-hr LC_{50}	Oshida, et al., 1973
					0.16^{ABC}	Sea urchin, *Psammechinus miliaris*	Noticeable abnormalities	Becker & Thatcher,1973
					0.15^{ABC}	Chiton, *Ischnochiton conspicuous*	100% kill, 10 days	Becker & Thatcher,1973
					0.14^{ABC}	Polychaete juvenile, *Neanthes arenaceodentata*	28-day LC_{50}	Oshida, et al., 1976
					0.14^{ABC}	Bay mussel, *Mutilus edulis*	3-4 day lethality after 0.5-3 day exposure	SCCWRP, 1973
					0.12^{ABC}	Polychaete, *Phyllodoce maculata*	4-day LC_{50}	Oshida, et al., 1976
					0.12^{ABC}	Barnacle cyprids	Lethal, 10 days	Becker & Thatcher,1973

Table VIII-7. (Cont.)

CONSTITUENT	CONCENTRATION (mg/l = ppm)					TAXA	EFFECT	REFERENCES
	A 5-MILE EFFLUENT[1]	B 7-MILE EFFLUENT[1]	C PRIMARY TREATMENT[2]	D SECONDARY TREATMENT[3]	BIOASSAY[4]			
Cu^{+2} (cont)	0.19	13.9	0.22	0.11	0.1^{ABCD}	Polychaete, *Nereis virens*	Threshold toxicity, 21 days	Becker & Thatcher, 1973
					0.1^{ABC}	Bay mussel, *Mytilus edulis*	5% dead, 7 days, 10C	Becker & Thatcher, 1973
					0.1^{ABC}	Giant kelp, *Macrocystis pyrifera*	50% inhibition of photosynthesis in 4 days	Becker & Thatcher, 1973
					0.1^{ABC}	Limpet, *Acmaea scabra*	Lethal, 3 days	Becker & Thatcher, 1973
					0.1^{ABC}	Green abalone, *Haliotis fulgens*	100% kill, 3 days	Becker & Thatcher, 1973
					0.1^{ABC}	Gastropod, *Astraea undosa*	100% kill, 5 days	Becker & Thatcher, 1973
					0.1^{ABC}	Gastropod, *Tegula spp.*	100% kill, 15-25 days	Becker & Thatcher, 1973
					0.1^{ABC}	Sea urchin, *Anthocidaris sp.*	Effect on egg development, 27C	Becker & Thatcher, 1973
					0.1^{ABC}	Sea urchin, *Hemicentrotus sp.*	Effect on egg development, 11-16C	Becker & Thatcher, 1973
					0.1^{ABC}	Pacific oyster, *Crassotrea gigas*	Effect on egg development 11-16C	Becker & Thatcher, 1973
					0.1^{ABC}	Polychaete, *Phyllodoce maculata*	7-day LC_{50}	Oshida, et al., 1976
					0.1^{ABC}	Polychaete, *Ophryotrocha labronica*	No reproduction	Oshida, et al., 1976
					0.08^{ABCD}	Bay mussel, *Mytilus edulis*	Modified sublethal response	SCCWRP, 1973
					0.08^{ABC}	Polychaete, *Mercierella enigmatica*	Modified sublethal response	SCCWRP, 1973
					0.05^{ABCD}	Bryozoan	Deleterious to all stages of development	Becker & Thatcher, 1973
					0.05^{ABCD}	Sea urchin, *Paracentrotus lividus*	Lethal	Becker & Thatcher, 1973
					0.05^{ABCD}	Gastropod, *Astraea undosa*	100% kill, 14 days	Becker & Thatcher, 1973
					$>0.05^{ABCD}$	Diatoms and dinoflagellates	Toxic, 20C	Becker & Thatcher, 1973
					0.04^{ABCD}	Bivalve larvae	Lethal	Becker & Thatcher, 1973
					0.03^{ABCD}	Dinoflagellate, *Gymnodinium breve*	Minimum amount lethal	Becker & Thatcher, 1973
					0.03^{ABCD}	Sea urchin, *Paracentrotus lividus*	Growth of arms disturbed	Becker & Thatcher, 1973
					0.025^{ABCD}	Polychaete, *Ophryotrocha labronica*	Growth rate inhibited	Oshida, et al., 1976
					0.024^{ABCD}	Barnacle cyprids	Attachment prevented	Becker & Thatcher, 1973
					$>0.02^{ABCD}$	Clam, *Mya arenaria*	Extremely toxic	Becker & Thatcher, 1973
					0.02^{ABCD}	Isopod, *Neosphaeroma oregonensis*	First apparent significant response	Becker & Thatcher, 1973
					$0.02-.01^{ABCD}$	Sea urchin, *Paracentrotus lividus*	Slowed growth of pluteus	Becker & Thatcher, 1973
					0.005^{ABCD}	Isopod, *Sphaeroma pentodon*	Modified sublethal response	SCCWRP, 1973
					$0.00265-0.00055^{ABCD}$	Phytoplankton (9 spp.)	Growth inhibited, 7 spp., 20C	Becker & Thatcher, 1973
					0.001^{ABCD}	Polychaete, *Nereis diversicolor*	30-50 hr LC_{50}, taken from low Cu sediments	Becker & Thatcher, 1973
					0.001^{ABCD}	Polychaete, *Neris diversicolor*	100 hr LC_{50}, taken from high Cu sediments	Becker & Thatcher, 1973

Table VIII-7. (Cont.)

CONSTITUENT	CONCENTRATION (mg/l = ppm)					TAXA	EFFECT	REFERENCES
	A 5-MILE EFFLUENT[1]	B 7-MILE EFFLUENT[1]	C PRIMARY TREATMENT[2]	D SECONDARY TREATMENT[3]	BIOASSAY[4]			
Cu^{+2} (cont)	0.19	13.9	0.22	0.05	0.0003^{ABCD}	Phytoplankton (1 sp.)	No growth	Becker & Thatcher,1973
					0.00025^{ABCD}	Polychaete, *Nereis diversicolor*	250-300 hr LC_{50}, taken low Cu sediments	Becker & Thatcher,1973
Cr^{+6}	0.0	0.0	0.0	0.0	200	Crab zoea, *Sesarma hematocheir*	24-hr LC_{50} w/K_2Cr_{04}	Oshida, et al., 1976
					60	Crab zoea, *Carcinus maenas*	3 week LC_{50} w/Na_2Cr_{04} · 10 H_2O	Oshida, et al., 1976
					56	Crab zoea, *Sesarma hematocheir*	24-hr LC_{50} w/Cr_2 $(SO_4)_3$	Oshida, et al., 1976
					35	Clam, *Rangia cuneata*	96-hr LC_{50} w/$K_2Cr_2O_4$ at 22‰ salinity	Oshida, et al., 1976
					20.3	Protozoan, *Opercularia sp.*	ILm	Sudo and Aiba, 1973
					12.9	Protozoan, *Colpidium campylum*	ILm	Sudo and Aiba, 1973
					10	Urchin, *Anthocidaris crassipina*	24-hr affected egg development w/$Cr_2(SO_4)_3$	Oshida, et al., 1976
					10	Urchin, *Anthocidaris crassipina*	24-hr affected egg development w/$K_2Cr_2O_7$	Oshida, et al., 1976
					10	Urchin, *Hemicentrotus pulcherimus*	72-hr affected egg development w/$K_2Cr_2O_7$	Oshida, et al., 1976
					10	Bay mussel, *Mytilus edulis*	48-hr affected egg development w/$K_2Cr_2O_7$	Oshida, et al., 1976
					10	Bay mussel, *Mytilus edulis*	48-hr affected egg development $Cr_2(SO_4)_3$	Oshida, et al., 1976
					10	Pacific oyster, *Crassostrea gigas*	24-hr affected egg development w/$K_2Cr_2O_4$	Oshida, et al., 1976
					8.0	Polychaete trochophore larvae, *Capitella capitata*	96-hr LC_{50} w/CrO_3	Oshida, et al., 1976
					5.0	Polychaete adult, *Capitella capitata*	96-hr LC_{50} w/CrO_3	Oshida, et al., 1976
					4.3-2.2	Polychaete, *Neanthes arenaceodentata*	96-hr LC_{50} w/$K_2Cr_2O_4$	Oshida, et al., 1976
					4.0-3.0	Polychaete adult, *Neanthes arenaceodentata*	96-hr LC_{50} w/$K_2Cr_2O_4$	Oshida, et al., 1976
					3.2	Barnacle adult, *Balanus amphitrite albicostatus*	1-hr cessation of cirri movement w/$Cr_2(SO_4)_3$	Oshida, et al., 1976
					1.89-1.44	Polychaete, *Neanthes arenaceodentata*	7-day LC_{50} w/$K_2Cr_2O_4$	Oshida, et al., 1976
					1.7-1.4	Polychaete adult, *Neanthes arenaceodentata*	7-day LC_{50} w/$K_2Cr_2O_4$	Oshida, et al., 1976
					>1.0	Polychaete adult, *Neanthes arenaceodentata*	96-hr LC_{50} w/CrO_3	Oshida, et al., 1976
					>1.0	Polychaete juvenile, *Neanthes arenaceodentata*	96-hr LC_{50} w/CrO_3	Oshida, et al., 1976
					1.0	Polychaete, *Nereis virens*	3-week LC_{50} w/Na_2CrO_4	Oshida, et al., 1976

Table VIII-7. (Cont.)

CONSTITUENT	CONCENTRATION (mg/l = ppm)					TAXA	EFFECT	REFERENCES
	A 5-MILE EFFLUENT[1]	B 7-MILE EFFLUENT[1]	C PRIMARY TREATMENT[2]	D SECONDARY TREATMENT[3]	BIOASSAY[4]			
Cr^{+6} (cont)	0.0	0.0	0.0	0.0	< 1.0	Urchin, *Hemicentrotus pulcherrimus*	72-hr affected egg development w/$Cr_2(SO_4)_3$	Oshida, et al., 1976
					0.7	Polychaete juvenile, *Neanthes arenaceodentata*	28-day LC_{50} w/CrO_3	Oshida, et al., 1976
					0.55	Polychaete adult, *Neanthes arenaceodentata*	28-day LC_{50} w/CrO_3	Oshida, et al., 1976
					0.53	Protozoan, *Voeticella Microstoma*	TLm	Sudo and Aiba, 1973
					0.3-0.2	Polychaete adult, *Neanthes arenaceodentata*	96-hr EC_{50} (mucous tube building) w/$K_2Cr_2O_7$	Oshida, et al., 1976
					0.28	Polychaete adult, *Capitella capitata*	28-day LC_{50} w/CrO_3	Oshida, et al., 1976
					0.1	Polychaete adult, *Neanthes arenaceodentata*	7-day EC_{50} (tube building) w/ $K_2Cr_2O_7$	Oshida, et al., 1976
					0.1	Polychaete adult, *Neanthes arenaceodentata*	440-day (3 generations) reproduction ceased w/$K_2Cr_2O_7$	Oshida, et al., 1976
					0.0125	Polychaete adult, *Neanthes arenaceodentata*	Brood size reduced w/$K_2Cr_2O_7$	Oshida, et al., 1976
Cr^{+3}	0.21	15.1	0.27	0.14	12.5^B	Polychaete adult, *Neanthes arenaceodentata*	7-day 5% mortality w/$CrCl_3$	Oshida, et al., 1976
					10.3^B	Oyster, *Crassotrea virginica*	EC_{50} (larval development) w/$CrCL_3$	Oshida, et al., 1976
Cr	$-^5$	$-^5$	$-^5$	$-^5$	300-100	European cockle, *Cardium edule*	48-hr LC_{50}	SCCWRP, 1973
					100	European brown shrimp, *Crangon crangon*	48-hr LC_{50}	SCCWRP, 1973
					10	Bryozoan, *Bugula*	Lethal in 5 hours	SCCWRP, 1973
					1.0	Urchin, *Paracentrotus*	Abnormal embryogenesis	SCCWRP, 1976
Ni^{+2}	0.02	1.27	0.03	0.02	12.5	Polychaete juvenile, *Neanthes arenaceodentata*	96-hr LC_{50}	Oshida, et al., 1976
					12.0	Polychaete adult, *Neanthes arenaceodentata*	96-hr LC_{50}	Oshida, et al., 1976
					11.0	Polychaete, *Nereis virens*	96-hr LC_{50}	Oshida, et al., 1976
					7.5	Polychaete adult, *Capitella capitata*	96-hr LC_{50}	Oshida, et al., 1976
					3.0	Polychaete adult, *Neanthes arenaceodentata*	28-day LC_{50}	Oshida, et al., 1976
					3.0	Polychaete juvenile, *Neanthes arenaceodentata*	28-day LC_{50}	Oshida, et al., 1976
					1.0^B	Polychaete, *Ophryotrocha labronica*	410-hr LC_{50}	Oshida, et al., 1976
					0.7^B	Polychaete adult, *Capitella capitata*	28-day LC_{50}	Oshida, et al., 1976

Table VIII-7. (Cont.)

CONSTITUENT	CONCENTRATION (mg/l = ppm)					TAXA	EFFECT	REFERENCES
	A 5-MILE EFFLUENT[1]	B 7-MILE EFFLUENT[1]	C PRIMARY TREATMENT[2]	D SECONDARY TREATMENT[3]	BIOASSAY[4]			
Cd^{+2} (cont)	0.02	1.27	0.03	0.02	0.36^B	Mussel, *Mytilus galloprovincialis*	30-day LC_{50}	Pavicic and Jaervenpaeae,1974
					0.30^B	Invertebrates	Induced morphological changes	SCCWRP,. 1975b
					0.22^B	Polychaete trochophore larvae, *Capitella capitata*	96-hr LC_{50}	Oshida, et al., 1976
					0.2^B	Oyster, *Crassostrea virginica*	Heavy mortality in 13 weeks	Oshida, et al., 1976
					0.17^B	Phytoplankton	Reduced photosynthesis	SCCWRP,, 1975b
					0.12^B	Invertebrates	Decreased osmoregulation	SCCWRP,, 1975b
					0.0^{ABCD}	Invertebrates	Delayed spawning in adults	SCCWRP,, 1975b
Pb^{+2}	0.04	1.13	0.05	0.03	>10	Polychaete adult, *Neanthes arenaceodentata*	96-hr LC_{50}	Oshida, et al., 1976
					>7.5	Polychaete juvenile, *Neanthes arenaceodentata*	96-hr LC_{50}	Oshida, et al., 1976
					6.8	Polychaete adult, *Capitella capitata*	96-hr LC_{50}	Oshida, et al., 1976
					5.0	Invertebrates	Decreased growth	SCCWRP, 1975b
					3.9	Bay mussel, *Mytilus edulis*	Modified sublethal response	SCCWRP, 1973
					3.2	Polychaete adult, *Neanthes arenaceodentata*	28-day LC_{50}	Oshida, et al., 1976
					2.5	Polychaete juvenile, *Neanthes arenaceodentata*	28-day LC_{50}	Oshida, et al., 1976
					1.3	Polychaete, *Mercierella enigmatica*	Modified sublethal response	SCCWRP, 1973
					1.2	Polychaete trochophore larvae, *Capitella capitata*	96-hr LC_{50}	Oshida, et al., 1976
					1.0^B	Polychaete adult, *Capitella capitata*	28-day LC_{50}	Oshida. et al., 1976
					1.0^B	Polychaete, *Ophryotrocha labronica*	+600-hr LC_{50}	Oshida, et al., 1976
					1.0^B	Invertebrates	Induced morphological changes	SCCWRP, 1975b
					0.3^B	Protozoan, *Christigera*	Decreased growth 12%	Gray & Ventilla,1973
					0.14^B	Isopod, *Sphaeroma pentodon*	Modified sublethal response	SCCWRP, 1973
Ni^{+2}	0.18	3.1	0.20	0.14	>330	European cockle, *Cardium edule*	48-hr LC_{50}	SCCWRP, 1973
					330-100	European brown shrimp, *Crangon crangon*	48-hr LC_{50}	SCCWRP, 1973
Fe^{+3}	0.64	78.8	0.69	0.53	330-100	European cockle, *Cardium edule*	48-hr LC_{50}	SCCWRP, 1973

Table VIII-7. (Cont.)

CONSTITUENT	CONCENTRATION (mg/l = ppm)					TAXA	EFFECT	REFERENCES
	A 5-MILE EFFLUENT[1]	B 7-MILE EFFLUENT[1]	C PRIMARY TREATMENT[2]	D SECONDARY TREATMENT[3]	BIOASSAY[4]			
Fe^{+3} (cont)	0.64	78.8	0.69	0.53	$100-33^B$	European brown shrimp, *Crangon crangon*	48-hr LC_{50}	SCCWRP, 1973
					32^B	Mussel embryo, *Mytilus*	Abnormal development	SCCWRP, 1973
					10^B	Urchin embryo, *Paracentrotus*	Abnormal development	SCCWRP, 1973
Mn^{+2}	0.02	0.19	0.02	0.03	32	Urchin embryo, *Paracentrotus*	Abnormal development	SCCWRP, 1973
					32	Mussel embryo, *Mytilus*	Abnormal development	SCCWRP, 1973

Note: There is uncertainty inherent in comparing discharged constituents with bioassay values. The effective concentration of each constituent is comparable between measured discharge level and bioassay level only if chemical assay techniques are identical. Moreover, toxicity values are valid only for those forms of constituents tested, and may not take into account the form and solubility the constituents may take in seawater. Thus, discharged constituents may not produce the indicated bioassay response, even when all other variables are considered equal.

[1] 1974 HTP effluent concentrations (SCCWRP, 1975a) reported as total chemical species of each constituent.

[2] Predicted effluent characteristics based on 1974 treatment reported as concentration for total chemical species of each constituent.

[3] Predicted effluent quality under full secondary treatment with UNOX (F. Hoeptner, personal communication, 23 December 1976) reported as concentration for total chemical species of each constituent.

[4] Concentration tested in bioassay for specified constituent form.

[5] No data for effluent concentrations.

[6] Total PCB's in effluent.

Table VIII-8. Lethal and sublethal effects of wastewater constituents on marine fish. The concentrations in the present 5-mile and 7-mile effluents as well as primary and secondary treatment are also given. The potential effects of the various effluent treatments are designated in the bioassay column by effluent column letter superscripts (page 1 of 2).

CONSTITUENT	CONCENTRATION (mg/l = ppm)					SPECIES	EFFECT	REFERENCES
	A 5-MILE EFFLUENT[1]	B 7-MILE EFFLUENT[1]	C PRIMARY TREATMENT[2]	D SECONDARY TREATMENT[3]	BIOASSAY[4]			
DDT	0.00072	0.00259	–[5]	–[5]	0.01^{B}	Killifish	Retarded fin regeneration	Weis & Weis, 1975
					50	American Eel	Decreased intestinal water absorption	Janicki & Kinter, 1971
					< 0.1	Grunion Fry	Increased pectoral fin ray asymmetry	Valentine & Soule, 1973
					0.1	Grunion Fry	Lethal	Valentine & Soule, 1973
					0.00053^{AB}	Striped Bass (small)	96-hour LC_{50}	EPA, 1975
					0.0026^{B}	Shiner Perch	96-hour LC_{50}	EPA, 1975
					0.00026^{AB}	Dwarf Perch	96-hour LC_{50}	EPA, 1975
					0.3-1.0	*Pleuronectes platessa*	48-hour LC_{50}	Portmann, 1970
Endosulfan	–[5]	–[5]	–[5]	–[5]	0.33-0.1	*Agonus cataphractus*	48-hour LC_{50}	Portmann, 1970
Azinphos-methyl (insecticide)	–[5]	–[5]	–[5]	–[5]	0.01-0.03	*Pleuronectes limanda*	48-hour LC_{50}	Portmann, 1970
PCB's	0.00036[6]	0.0033[6]	–5	–5	>10	*Agonus cataphractus*	48-hour LC_{50}	Portmann, 1970
Aroclor 1248					>10	*Agonus cataphractus*	48-hour LC_{50}	Portmann, 1970
Aroclor 1254					>10	*Agonus cataphractus*	48-hour LC_{50}	Portmann, 1970
Aroclor 1260					>10	*Agonus cataphractus*	48-hour LC_{50}	Portmann, 1970
Clophen A30					>10	*Agonus cataphractus*	48-hour LC_{50}	Portmann, 1970
Clophen A60								
Hg^{+2}	0.0032	0.154	0.0041	0.0011	0.230	Killifish	Decreased liver acid phosphatase, RNAase, xanthine oxidase and catalase activity	Jackim, et al., 1970
							Increased liver alkaline phosphatase activity	Jackim, et al., 1970
					0.02^{B}	Killifish	Reduced liver and kidney δ-amino-levalinic acid dehydrogenase activity	Jackim, 1973
					3.3	*Pleuronectes flesus*	48-hour LC_{50}	Portmann, 1970
Ag^{+1}	0.02	0.04	0.03	0.019	0.04^{B}	Killifish	Decreased liver alkaline phosphatase, xanthine oxidase, catalase and RNAase activity	Jackim, et al., 1970
					0.02^{ABC}	Killifish	Increased liver δ-aminolevalinic acid dehydrogenase activity	Jackim, 1973
Zn^{+2}	0.24	23.9	0.34	0.23	10^{B}	Killifish	Reduced liver δ-aminolevalinic acid dehydrogenase activity	Jackim, 1973
Ammonia	13.8	228	15.8	17	1.2^{ABCD}	Dogfish	Lethal in 193 minutes	Becker & Thatcher, 1973
Detergents	5.1	–[5]	7.7	1.27	>10	*Pleuronectes flesus*	48-hour LC_{50}	Portmann, 1970
Phenol	0.06	–[5]	0.06	0.02	33-100	*Pleuronectes flesus*	48-hour LC_{50}	Portmann, 1970
Cu^{+2}	0.19	13.9	0.22	0.11	0.180^{ABC}	Winter Flounder	Increase in chloride cells with a decrease in mucus cells in gills	Baker, 1969
							Vacuolation of gill epithelial cells	
					1.0^{B}	Winter Flounder	Fatty metamorphosis of liver	Baker, 1969
							Renal necrosis	
							Gross changes in gill structure	
					3.2^{B}	Winter Flounder	Complete cell destruction in gills	Baker, 1969
					0.5^{B}	Killifish & Atlantic Silversides	Lesions in olfactory and lateral line sensory organs	Gardner & LaRoche, 1973
					1.0^{B}	Killifish	Renal lesions	Gardner & LaRoche, 1973
					0.25^{B}	Killifish Zygotes	Reduced survival after hatching by 45 percent	Gardner & LaRoche, 1973
					3.0^{B}	Killifish Zygotes	No hatching	Gardner & LaRoche, 1973
					2.1^{B}	Killifish Larvae	24-hour LC_{50}	Gardner & LaRoche, 1973
					1.2^{B}	Killifish Larvae	48-hour LC_{50}	Gardner & LaRoche, 1973
					1.0^{B}	Killifish Larvae	72-hour LC_{50}	Gardner & LaRoche, 1973
					$1\text{-}3.3^{B}$	*Pleuronectes flesus*	48-hour LC_{50}	Portmann, 1970
					3.2^{B}	Killifish	Decreased liver catalase, RNAase, and acid phosphatase activity	Jackim, et al., 1970
							Increased liver xanthine oxidase activity	
Cr^{+6}	0.0	0.0	0.0	0.0	15	Speckled Sanddab	Decreased feeding in 4 days	SCCWRP, 1975a
					3.7	Speckled Sanddab	Decreased feeding in 14 days	SCCWRP, 1975a
					2.2	Speckled Sanddab	Decreased feeding in 21 days	SCCWRP, 1975a
					31.0	Speckled Sanddab	4-day LC_{50}	SCCWRP, 1975a
					5.4	Speckled Sanddab	21-day LC_{50}	SCCWRP, 1975a
					33-100	*Agonus cataphractus*	48-hour LC_{50}	Portmann, 1970
Cd^{+2}	0.02	1.27	0.03	0.02	27	Killifish	Decreased liver acid phosphatase, xanthine oxidase, catalase and RNAase activity	Jackim, et al., 1970
Pb^{+2}	0.04	1.13	0.05	0.03	188	Killifish	Decreased liver acid phosphatase, xanthine oxidase, catalase and RNAase activity	Jackim, et al., 1970
							Increased liver alkaline phosphatase activity	
					10	Winter Flounder and Killifish	Reduced liver and kidney δ-aminolevalinic acid dehydrogenase activity	Jackim, 1973

Table VIII-8. (Cont.)

[1] 1974 HTP effluent concentrations (SCCWRP, 1975a) reported as total chemical species of each constituent.

[2] Predicted effluent characteristics based on 1974 treatment reported as concentration for total chemical species of each constituent.

[3] Predicted effluent quality under full secondary treatment with UNOX (Hoeptner, 23 December 1976) reported as concentration for total chemical species of each constituent.

[4] Concentration tested in bioassay for specified constituent form.

[5] No data for effluent concentrations.

[6] Total PCB's in effluent.

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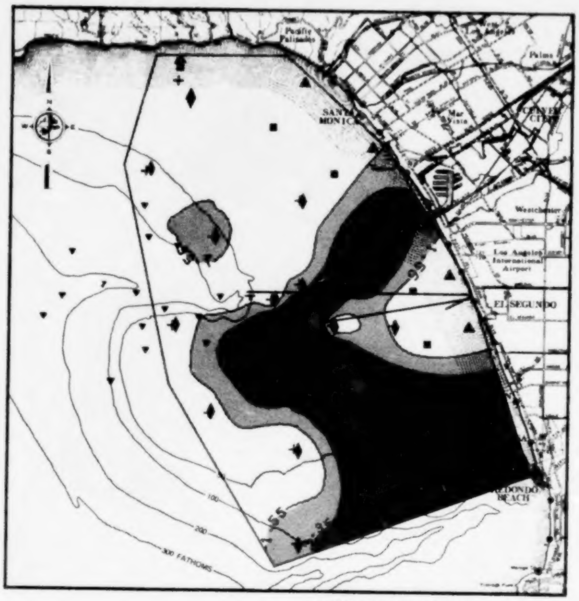
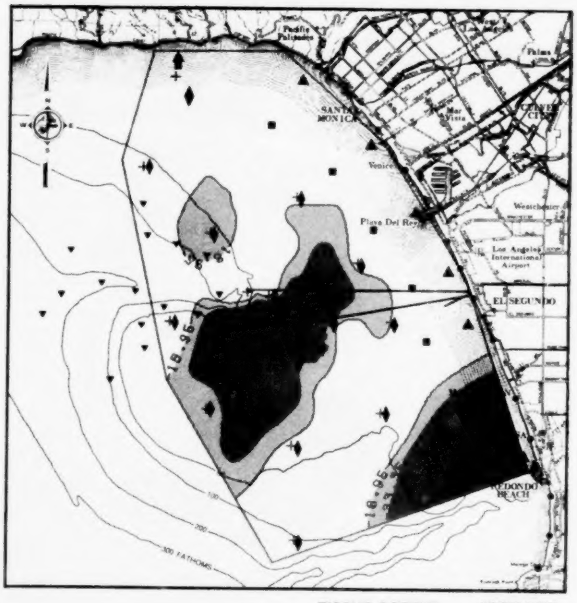

Pacific Palisades
Palms
Santa Monica
Mar Vista
Culver City
Westchester
Los Angeles International Airport
El Segundo
Redondo Beach
100
200
300 FATHOMS

TISSUE CHROMIUM


Pacific Palisades
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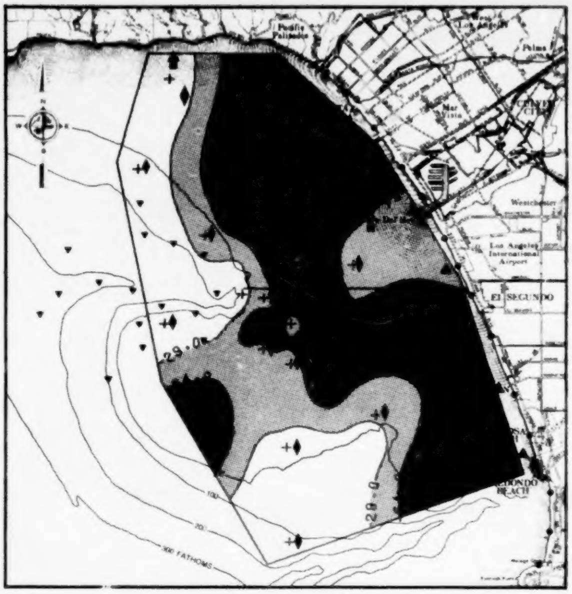
Los Angeles International Airport
El Segundo
Redondo Beach
18.95
100
200
300 FATHOMS

TISSUE COPPER 198P-293

Figure VIII-2. Concentration of chromium and copper in mg/dry kg in the tissues of benthic organisms collected near the HTP outfalls in 1972 (data from DPW, 1973).


Pacific Palisades
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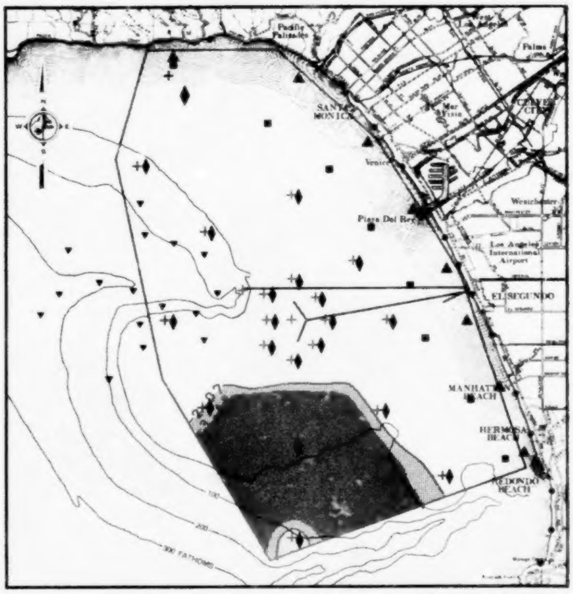
TISSUE ZINC


Pacific Palisades
Palms
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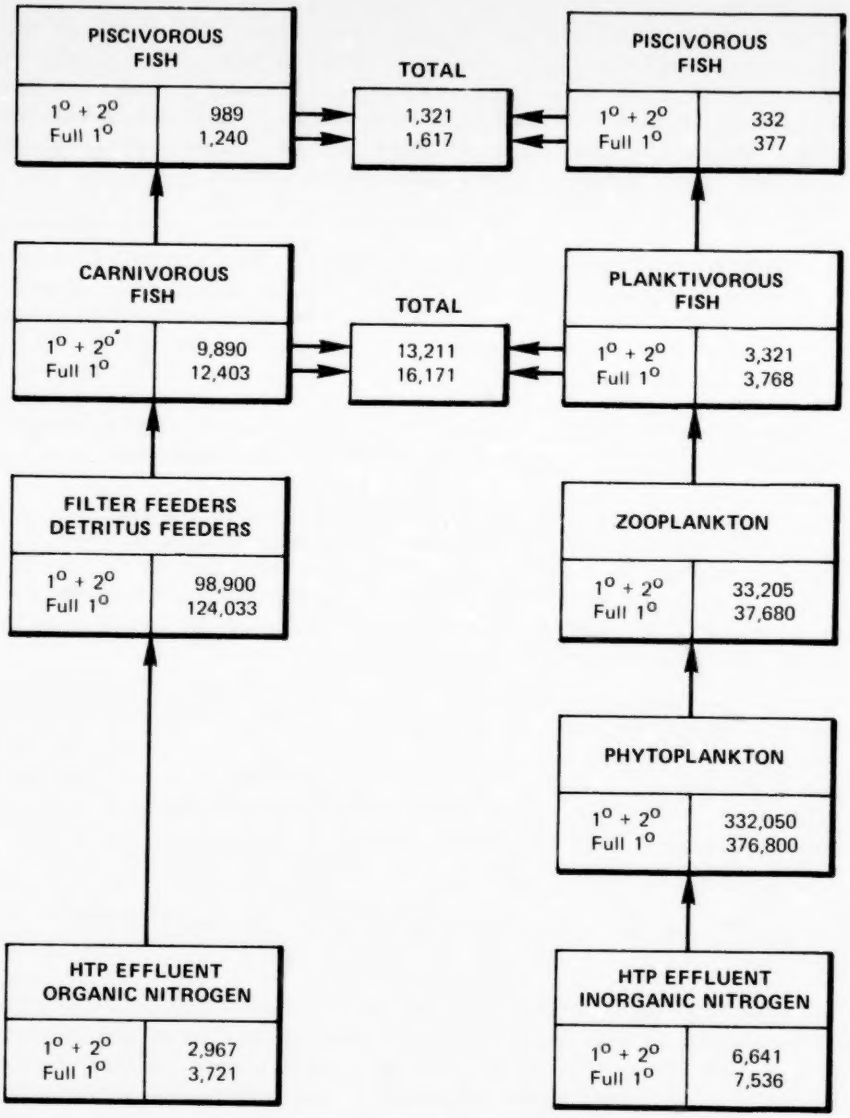
Venice
Mar Vista
Culver City
Playa Del Rey
Westchester
Los Angeles International Airport
EL SEGUNDO
MANHATTAN BEACH
HERMOSA BEACH
REDONDO BEACH
100
200
300 FATHOMS

TISSUE ARSENIC 198P-292

Figure VIII-3. Concentration of zinc and arsenic in mg/dry kg in the tissues of benthic organisms collected near the HTP outfalls in 1972 (data from DPW, 1973).


PISCIVOROUS FISH
1° + 2°
Full 1°
989
1,240
TOTAL
1,321
1,617
PISCIVOROUS FISH
1° + 2°
Full 1°
332
377
CARNIVOROUS FISH
1° + 2°
Full 1°
9,890
12,403
TOTAL
13,211
16,171
PLANKTIVOROUS FISH
1° + 2°
Full 1°
3,321
3,768
FILTER FEEDERS DETRITUS FEEDERS
1° + 2°
Full 1°
98,900
124,033
ZOOPLANKTON
1° + 2°
Full 1°
33,205
37,680
PHYTOPLANKTON
1° + 2°
Full 1°
332,050
376,800
HTP EFFLUENT ORGANIC NITROGEN
1° + 2°
Full 1°
2,967
3,721
HTP EFFLUENT INORGANIC NITROGEN
1° + 2°
Full 1°
6,641
7,536

NOTE: All numbers = metric tons. Detritus and filter feeders are assumed to have a nitrogen content of 3 percent and phytoplankton 2 percent. The assumptions used in the calculations are explained in more detail in Chapter III.

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Figure VIII-4. Standing crop biomass pyramids based on nitrogen in the Hyperion 5-mile effluent (1°+2°) and in primary (1°) effluent to be discharged during construction.

yellowfin and skipjack* tuna brought into Los Angeles Harbor) or to 2,960 metric tons of planktivorous and carnivorous fish (3 percent of the 1972 total commercial catch brought into Los Angeles Harbor). Of the non-tuna fish considered in this analysis, approximately 55 percent brought into Los Angeles Harbor are top carnivores and 45 percent lower trophic level fish. Thus, any potential effects on the fishery would be most evident in the lower trophic level species collected.

(c) Impacts of Discharging Mixed Liquor. Discharge of mixed liquor from the 7-mile outfall should have little or no additional impact on the organisms in the marine ecosystem than the present sludge discharge has had. If, however, mixed liquor is discharged from the 5-mile outfall along with the primary effluent, organisms in the vicinity of the outfall may be exposed to higher concentrations of metals and chlorinated hydrcarbons than those to which they have been acclimated. The short duration of the discharge (2 to 4 weeks) would preclude any measurable effects.

(d) Impacts of Discharging Secondary Effluent Through the 1-Mile Outfall. The discharge of chlorinated secondary effluent from the 1-mile outfall for a period of 2 to 3 weeks during installation of the effluent eductor should have very little impact on organisms in the vicinity of the outfall. Similar effluent is discharged regularly (3 hours once a week) to maintain the pipe in standby condition.

Because the concentrations of most toxicants in secondary effluent are below the known thresholds of direct toxicity to marine organisms, little or no direct toxicity is anticipated. Because of the very short anticipated duration of the release, bioaccumulation of toxicants by marine biota will probably be no more substantial than that which occurs during the transient high nearshore levels during storm runoff.

d. Impacts on Socioeconomic Elements of the Environment.

(1) LAND USE AND AESTHETICS. The most direct impacts of HTP alternatives on land use will be to convert undeveloped acreage on the HTP site to part of the treatment works. No changes in land use will occur off-site. Two potential problems exist regarding use and/or aesthetics on adjacent properties.

First, residents in the area east of the present plant will be subjected to temporary increases in odors and other air pollutants. Also, some residents will be in view of construction activities and close enough to hear construction sounds. In general, conditions following construction will be an improvement over existing conditions, but the duration of the construction phase (almost 5 years) means that adverse construction impacts will be considered long-term by residents in the area. Noise and air quality are discussed in Section VIII.A.1.b. Visual impacts will be primarily that residents will see bared hillsides, fresh excavation, and heavy equipment, etc. where vegetation presently exists. Where there is currently little activity and a fairly tranquil atmosphere, there will be intensive activity during working hours. Construction activities will be considered interesting by some, but will be a definite disruption of existing conditions. The No Project Alternative will still include construction on presently undeveloped land. However, the extent of activities will be much less than for the 307 mgd alternative. The activities associated with the 397 mgd alternative would be more extensive than for 307, and would occur somewhat closer to the residential areas on the east side of the HTP site.

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*The catch brought into the Los Angeles Harbor in 1972 is shown on Table III-C-14 as 205,033,211 pounds or 92,879 metric tons. This number does not include the yellow fin or skipjack tuna catch because these species are, for the most part, caught well away from the Southern California Bight, and are brought to Los Angeles only because of the large tuna canneries there.

Second, there are potential construction phase impacts on recreational facilities along the beach. Construction scheduling has been adjusted to minimize any potential problems. "Beach construction activities will be scheduled for the period between February and June 1981. Every attempt will be made to avoid the peak beach usage period of June 15 through September 15.

"The one-mile ocean outfall will not be used for the discharge of primary effluent. The secondary treatment system will be installed and operational before the effluent eductor is installed.

"Chlorination facilities will be kept in operation throughout the construction period. Chlorination of Hyperion effluent will be performed as required for the protection of public health. No restriction of public contact with ocean waters is required.

"Public access to the beach will not be changed from existing conditions. The beach entrance and parking lot facilities at the end of Imperial Highway will not be affected by construction activities. A separate entrance for construction traffic is planned.

"The bike path will be temporarily rerouted around construction work and should be available for public use during the entire period of construction.

"The effluent eductor will not have any structures that will be above existing ground level and will therefore not affect coastal hydraulics and sand movements " (CLA, 1976).

(2) POPULATION. No changes in population are expected to result from construction phase impacts of HTP. The entire labor force probably will be drawn entirely from within commuting distance of the site, so no relocations are expected as a result of direct employment opportunities.

(3) EMPLOYMENT. The 2,994 manyears of labor required for HTP construction (307 mgd) will provide approximately 4,500 jobs* of up to 5 years duration. The average annual number of construction jobs anticipated for the HTP 307 mgd alternative is 860. This is close to one percent of the estimated 1976 construction labor force in Los Angeles County and about 10 percent of the estimated number of unemployed construction workers in the L.A. Basin in 1976. HTP construction would be only one portion of the construction effort needed to complete any project alternative (see Table VIII-1 for a summary of major elements comprising each alternative, and Table VIII-2 for a summary of labor requirements for project elements).

Over the next five or six years, total construction employment in the county for any project alternative (i.e., all elements of Alternatives B4C, C3, CS, or E2) except for No Project, would include roughly 10,000 job holders when allowances are made for limited duration tasks, part-time workers, illness, etc.

Wage and salary employment in contract construction in Los Angeles County averaged 92,400 in 1976. This was the lowest level of construction job holding during the 1970s. Employment in this industrial division typically averages over 100,000, although the month-to-month variation can be quite large (Southern California Employment Data and Research, Nov., 1976; and Southern California Employment Data and Research, 1976 and Security Pacific Bank, Feb. 28, 1977). Accordingly, the 10,000 job holders estimated for the first five years would amount to an average of 2,000 per year or about 2 percent of the usual construction labor force.

Direct construction employment should have an appreciable beneficial impact upon employment. In 1975, for example, total unemployment in Los Angeles County averaged 127,272 over that year. Of this, the construction industry division accounted for an average of 12,953. The month-to-month variation was large, ranging from 8,978 in October 1975 to 17,465 in March 1975. These data come from unemployment insurance claims compensated for by the construction industry. As such, the amount of unemployment is underestimated since some were not eligible for compensation and others had used up their eligibility (Southern California Employment Data and Research, April 1976). The wastewater facility construction workers - those associated with the earlier heavy projects - could amount to between 11 and 20 percent of the construction labor unemployed.

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* "Construction jobs" are differentiated because the manyears relate to the rates, where 2,112 manhours makes up a full-time manyear. Actual job time will be typically less, as evidenced by comparing industry earnings on an annual basis with employment data for the same years to see the degree of part-time employment or other reasons for less-than-full-time work (Regional Economic Information Systems, 1977 and Southern California Employment Data and Research, 1976). These sources were used to estimate the "jobs" shown in text and in Table VIII-2.

In these terms, then, the employment generated by wastewater facility construction needs would be a potentially large source of alleviation of the chronically large unemployment in the construction sector. Secondary impacts on the economy are discussed in Chapter IX.

A detailed impact estimate would have to be based on consideration of individual crafts and unemployment incidence not reflected in UI claims compensation. Detailed needs by craft, duration of tasks by facility, etc., are not yet available to provide this analysis.

(4) ECONOMY. Construction employment will add $85,641,000 in wages to the local economy over the 5-year construction period (307 mgd alternative). About $5,200,000 in wages would be added for the HTP conversion flexibility element required in Alternative E2; $143,591,000 for the 397 mgd unit; and $60,980,000 for the No Project HTP changes. The secondary impacts of this money in stimulating the economy are discussed in Chapter IX.

The costs of the HTP construction work will be paid 75 percent from federal funds, 12.5 percent from state funds, and 12.5 percent from city funds. The city's share of the costs probably will be paid by bond funds.

(5) COMMUNITY SERVICES. No schools, hospitals, churches, or other facilities for offering community services are within an area which would be affected by HTP construction. Depending on the location for deposit of excavated material, it is possible that truck traffic could cause some problems with congestion on roads or with noise. These factors will be taken into consideration when selecting a disposal site.

Because construction workers are not expected to relocate to work at HTP, there will not be construction related impacts on increasing the use of community services.

The potential impacts on the adjacent beach recreation area were discussed in the Section (1) above. Chlorination facilities will be maintained during construction so there should be no health reasons for limiting recreational use of the ocean.

(6) UTILITIES. Sewage treatment at HTP will differ during construction, as described previously, but there will be no interruptions of service to sewer users as a result of the HTP work. Power, water, and other utilities required for construction are expected to be available from existing sources without causing any interruptions of service to other users.

(7) ENERGY USE AND CONSERVATION. Consumption of fossil fuels and of electricity for construction purposes has not been estimated.

(8) TRANSPORTATION. Traffic at Hyperion will be greatly increased during the simultaneous construction of all three project phases. Excavation of nearly 1.5 million cubic yards of sand will require about 80,000 trips to a disposal site assuming a truck loading of 18 cubic yards. An average of 860 construction workers a day in addition to the Hyperion operating personnel will be traveling to Hyperion. Additional traffic also will be generated by the movement of construction equipment to and from the site.

The Imperial Highway on the northern boundary and Vista Del Mar on the west are the major access roads to the HTP. Temporary driveways will be installed for the routing of construction traffic. The location and number of driveways have not been determined. A permanent driveway will be installed at the south end of Hyperion on Vista Del Mar.

Recent traffic volumes and approximate roadway capacities are listed in Table VIII-9. These existing volumes are highly directional and fluctuate widely between peak hours and off-peak hours.

Table VIII-9. Traffic counts at HTP (City of Los Angeles, Department of Traffic, April 1975).

STREET	ADT	MORNING PEAK-HOUR	EVENING PEAK-HOUR	APPROXIMATE CAPACITY V/hr.
Vista Del Mar S/O Imperial Hwy.				
N/B	6,570	1,445	468	1,600
S/B	6,340	322	1,251	2,400
Imperial Hwy. E/O Vista Del Mar				
E/B	3,762	625	256	2,100
W/B	4,143	238	665	2,000

Commuting construction workers would add as many as 860 vehicles to traffic on Vista Del Mar during both the morning and evening peak hours. If the direction in which workers commute follows existing patterns, the additional vehicles would result in total peak-hour traffic in excess of the approximate capacity of Vista Del Mar. The fact that commuting vehicles would be turning onto the HTP site, would greatly exacerbate the problem.

Truck traffic during excavation of the site would be equivalent to more than one truck per minute of an 8-hour working day if this phase of the project were completed in 6 months. If trucks were restricted from highway use during peak-hours, this additional traffic could be accommodated without severe impacts.

Connection of HTP to a water main on Imperial Highway and installation of piping for the effluent eductor will provide traffic bottlenecks for short periods of time. Construction of driveways would temporarily reduce the number of traffic lanes.

The overall effect of the Hyperion construction on traffic will be to heavily load the traffic system in the vicinity of Hyperion during daylight hours. The traffic load is not expected to change existing traffic patterns. Accessibilitv to beach recreational facilities, the City of El Segundo, and to the Scattergood Steam Plan will be minimally affected, and only by the increased traffic volume (CLA, 1976).

(9) AREAS OF SPECIAL SIGNIFICANCE. In a report dated 9 June 1976 by John F. Romani concerning expansion of the Hyperion Treatment Plant, it was determined that no direct impact on archaeological resources would result from proposed construction at the site. Similarly, no historical monuments that would be exposed to adverse effects were found to exist in the vicinity of the plant.

If, however, archaeological or paleontological resources are discovered in the course of construction of any part of this project, cessation of this activity should occur until a proper evaluation by appropriate experts can be made. All construction plans should be coordinated with authorities knowledgeable about local historical preservation, archaeology, and paleontology. Indirect impacts upon the preservation of cultural resources will be discussed in Chapter IX.

The Coastal Strand habitat on the L.A. International Airport property, and the habitat for the endangered El Segundo blue butterfly were discussed in the section on Terrestrial Ecosystems. In summary, no adverse direct impacts due to HTP construction are anticipated.

2. SEPULVEDA WATER RECLAMATION FACILITY

a. Project Summary. Construction for the Sepulveda Water Reclamation Facility (SF) would start with an initial 40 mgd plant. Additions of 30 mgd and 15 mgd are considered as an alternative to no expansion of the initial plant. The third alternative is no construction at all.

The initial 40 mgd plant would be constructed on a 88.3 acre site leased by the City of Los Angeles from the U.S. Army Corps of Engineers, located in the Sepulveda Dam Recreational Area. Construction would proceed during the years 1977, '78, '79 and '80, with a total of 671 manyears of direct labor expected. Construction costs (in 1975 dollars) would be approximately $38,356,000. Until the SF became operational, sewage from the San Fernando Valley would continue to be treated downstream at HTP and the existing L.A.-Glendale Water Reclamation Plant (LA-GWRP). Hydraulic problems would increase slightly over this period while waste loads in the Valley continue to increase. No interruption of service due to construction is foreseen.

One project alternative is continued operation of the 40 mgd plant, without additions, to the year 2000. Another alternative would include additions to SF of 30 mgd in 1980, and of 15 mgd in 1993. The construction of these additions would take 2 years for each project. For the 30 mgd addition, 376 manyears of direct labor would be needed. Costs would be $21,503,000. For the 15 mgd addition, 202 manyears would be needed with total costs equaling $11,569,000. Both expansions could be accommodated on existing open space, and both could be connected to the system, following construction, with no interruption of service. The impacts of the 30 mgd and 15 mgd units should be considered similar but proportionately smaller than the impacts discussed in this section for the construction of the initial 40 mgd unit.

The No Project Alternative would not include any construction of a treatment plant in the Sepulveda Dam area.

b. Impacts on Physical Elements of the Environment.

(1) SOILS AND TOPOGRAPHY. The City has completed work required by its lease agreement to remove a volume of earth from the flood control basin equal to the total volume of the SF. Impacts related to this work are not dicussed here. In addition to this completed work, limited amounts of excavation and grading of the site will be required during construction. It is not known whether or not off-site disposal areas will be required. The site is presently almost flat, and some relief will be added for development of the Japanese Garden.

(2) HYDROLOGY AND WATER QUALITY. Water will be used during construction for settling dust, washing equipment, and mixing concrete. The quantities, sources, and disposal of these waters have not been determined. Runoff from graded areas should be minor but, if needed, berms should be used to prevent any siltation of the Los Angeles River. Groundwater is an important resource in the area and any potentially polluting construction activities should be carried out in areas designed to control infiltration of pollutants.

Sewage treatment will not commence until the construction of SF is complete. Because no treatment capacity presently exists at the site, there will be no impact of effluents during the construction phase.

Potential problems associated with flooding are included in the discussion of operation phase impacts. A 100-year flood or worse during construction probably would result in significant delays and some losses of equipment and materials.

(3) AIR RESOURCES. Air quality will be adversely affected during construction due to vehicle emissions, dust generation, and temporary generation of odors associated with construction activities and vehicles. The limited need for earth moving will help to keep vehicle emissions and dust to a minimum.

(4) NOISE AND VIBRATION. Construction traffic and activities will be the major sources of noise. Noise levels expected from different types of construction equipment and activities are the same as those above on Table VIII-4.

c. Impacts on Biological Elements of the Environment.

(1) TERRESTRIAL RESOURCES. Construction on the 88.3 acre SF site will require grading and removal of existing habitats. At present, nearly the entire site is covered by row crops, primarily corn. Some weedy species border the agriculture land. Small drainage channels support limited emergent vegetation. Birds, small mammals, reptiles, and amphibians presently utilizing the habitat will be destroyed or displaced during construction activities. It is highly unlikely that any rare or endangered plant or animal species could be found on the site.

(2) AQUATIC RESOURCES. The drainage ditches presently crossing the site will be relocated prior to construction. The existing habitat will be eliminated but impacts will be confined to the site. No other direct construction phase impacts are expected to aquatic ecosystems provided that precautions are taken to prevent runoff during grading operations.

d. Impacts on Socioeconomic Elements of the Environment.

(1) LAND USE AND AESTHETICS. The Sepulveda Facility will replace acreage presently in agricultural use. Construction phase impacts on adjacent land will be limited to minor disturbances to recreational areas bordering the Sepulveda Facility site. Park areas to the west and south of the construction site can be expected to be subjected to some degradation in air quality, some increases, some visual impacts, and limited traffic congestion. None of these impacts is expected to seriously interfere with recreational activities.

(2) POPULATION. No changes in population are expected to result from construction phase impacts. No relocations of construction workers and families are expected as a result of direct employment opportunities from the project. The labor force will probably be drawn entirely from within commuting distance of the site.

(3) EMPLOYMENT. The 671 manyears of labor required for the SF construction of the 40 mgd initial facility may provide approximately 1,000 jobs of a month to 3 years' duration. The average annual number of construction jobs anticipated for the project is roughly 300. This is 0.3 percent of the estimated 1976 construction labor force in the county and 3 to 5 percent of the estimated number of unemployed construction workers in 1975.

(4) ECONOMY. Construction employment will add $19,178,000 in wages (1975 dollars) to the local economy over the 2-3 year construction period. Financing for the construction project will be the same as for the Hyperion project.

(5) COMMUNITY SERVICES. No increases on the use of community services are expected as a result of construction phase impacts of the project, because no construction workers are expected to relocate for employment. No churches, hospitals, schools or other community facilities are located in the area which is expected to be impacted by SF construction. Minor impacts due to increased traffic off-site are possible. This is discussed in the section on Land Use. There will be limited impacts on adjacent recreational areas. The opportunities for recreational uses of these areas will not be limited but the quality of the recreational experience may be impaired.

(6) UTILITIES. Power, water and other utilites required during construction are expected to be available from existing sources. No interruptions of service are expected to result from construction of the plant.

(7) ENERGY USE AND CONSERVATION. Consumption of energy for construction purposes has not been estimated.

(8) TRANSPORTATION. Access to the site would be off Woodley Avenue, which borders the site on the west and the southwest. Increases in traffic by about 400 vehicles could be expected during commuting hours due to construction workers. If off-site disposal is required for excavated earth, some extra truck traffic will be generated. Deliveries and other requirements will generate truck traffic.

Traffic generated by project construction activities is not expected to cause congestion on the streets adjacent to the Sepulveda site. Existing traffic conditions on Woodley Avenue and Burbank Boulevard are light. A recent traffic count by the Los Angeles Department of Traffic is shown in Table VIII-10. Additional trips generated by the visiting public using the adjacent picnic facilities are not expected to significantly contribute to traffic loading. These trips will generally occur during off-peak traffic hours and on weekends (City of Los Angeles, Department of Public Works Bureau of Engineering, June 1975).

(9) AREAS OF SPECIAL SIGNIFICANCE. An archaeological survey of the site was conducted by the University of California at Los Angeles. No archaeological resources were identified on the proposed site and no historical structures exist on the project site. However, both paleontological and archaeological resources have been found in the immediate vicinity raising the possibility that construction could uncover additional subsurface materials.

Table VIII-10. Traffic counts at SF site (City of Los Angeles, Department of Traffic, April 1975).

WOODLEY AVENUE	A.M.PEAK VEHICLES/HR.	P.M.PEAK VEHICLES/HR.	APPROXIMATE CAPACITY
Northbound at Victory Blvd.	200	260	2,000
Southbound at Burbank Blvd.	240	220	1,800

3. LOS ANGELES-GLENDALE WATER RECLAMATION PLANT ADDITION

a. Project Summary. The Los Angeles-Glendale Water Reclamation Plant (LA-GWRP) has a present capacity of 20 mgd. The proposed project would add a 10 mgd unit in parallel with the existing facilities. The No Project Alternative would be to make no additions to the present 20 mgd unit.

The 10 mgd unit could be added to LA-GWRP on the existing site, and the new unit could be tied into the system with no interruption in the present level of service. Construction would occur in 1988 and would require about 104 manyears of direct labor. Construction costs would be approximately $5,937,000.

b. Impacts on Physical Elements of the Environment.

(1) SOILS AND TOPOGRAPHY. Addition of the 10 mgd unit to the existing 20 mgd L.A.-Glendale Water Reclamation Plant can be accomplished on the existing 15 acre site with a minimum of excavation and grading. No need is anticipated for any off-site disposal of earth. Minor amounts of erosion and dust generation can be expected as a result of construction activities.

(2) HYDROLOGY AND WATER QUALITY. Quantities, sources and disposal of water needed during the construction phase have not been determined. Precautionary measures can be taken to prevent silt or other pollutants from reaching the Los Angeles River. Using proper precautionary measures, no impacts are expected on quality of surface or groundwater as a result of construction.

(3) AIR RESOURCES. Construction-related impacts on air quality will result from vehicular emissions, dust generation, and minor odors produced during the construction phase. Vehicle emissions would be considerably less than the amounts predicted during construction of the HTP. On the northeast and south side of the plant, the industrial land uses would not be adversely impacted by construction effects on air resources. The golf course to the west of the plant site could be occasionally affected during peak periods of earth-moving activities.

(4) NOISE AND VIBRATION. Construction traffic and use of construction equipment in the project area will increase noise levels. The land use adjacent to the project sites is not expected to be affected by noise during the construction phase. Noise impacts will be similar to those at the Sepulveda Facility site.

c. Impacts on Biological Elements of the Environment.

(1) TERRESTRIAL RESOURCES. Weedy vegetation and a few ornamental plantings will be removed for the 10 mgd addition to the Los Angeles-Glendale Water Reclamation Plant. The birds, small mammals, reptiles, and amphibians utilizing the existing habitat will be displaced or destroyed during construction. It is highly unlikely that any rare or endangered species exist on the site.

(2) AQUATIC RESOURCES. If adequate measures are taken to protect the Los Angeles River from any potential siltation or other pollution due to construction, there will be no impacts on aquatic resources.

d. Impacts on Socioeconomic Elements of the Environment.

(1) LAND USE AND AESTHETICS. The proposed project will convert most of the remaining undeveloped acreage of the site to part of the treatment works. The small industrial plants, foundaries and warehouses bordering the north, east and south sides of the site will not be impacted by this change in land use. Minor indirect impacts are possible in the golf course and other recreational areas across the Los Angeles River to the west side of the site. Minor disturbances of this area could be expected from increased noise levels and air pollutants. Impacts of plant construction are not expected to be sufficiently great to affect use of the recreational facilities. The change in visual appearance of the site will not be great. The addition to the plant will be similar to the existing plant and structures will fit into the industrial surroundings.

(2) POPULATION. No changes in population are expected to result from construction phase impacts of the addition to the Los Angeles-Glendale Water Reclamation Plant. As with other construction projects in the Los Angeles area, the labor force is expected to be drawn entirely from within commuting of the site.

(3) EMPLOYMENT. The 104 manyears of labor required for the construction of the 10 mgd addition will provide approximately 200 jobs of one month to two years' duration. The average number of construction jobs anticipated per day is approximately 100.

(4) ECONOMY. Construction employment will add $2,968,500 (1975 dollars) in wages to the local economy over the 2 year construction period. Stimulation of the economy, due to these expenditures, are discussed in Chapter IX.

(5) COMMUNITY SERVICES. Because construction workers are not expected to relocate in order to obtain employment for the project, there will be no changes in the existing use of community facilities as a result of construction. No schools, hospitals, churches or other community facilities are within an area which would be affected by construction activities.

(6) UTILITIES. Power, water, and other utilities required for construction are expected to be available from existing sources without causing interruptions in service to other users. No interruption of existing sewage treatment at the LA-Glendale plant is expected during construction of the 10 mgd addition.

(7) ENERGY USE AND CONSERVATION. Use of energy for construction purposes has not been estimated.

(8) TRANSPORTATION. Increases in local traffic can be expected on roads adjacent to the construction site. If each construction worker drives his own vehicle there will be approximately 100 vehicles per day entering and leaving the site during commuting hours. Primary access to the LA-GWRP site is from the Colorado Boulevard Extension Freeway, a short freeway segment which connects the extension of Colorado Boulevard at San Fernando Road with the Golden State Freeway to the west. Existing eastbound freeway traffic uses the Colorado Boulevard off-ramp; westbound traffic must use the Edenhurst Avenue off-ramp. Traffic to the site from the Colorado Boulevard Extension Freeway experiences little or no congestion. Because the Colorado Boulevard South Frontage Road terminates at the Sterer Engineering and Manufacturing Company plant, there is a very low volume of traffic on that street. Vehicular movement from the site to either the Golden State Freeway or San Fernando Road is excellent.

4. LA CIENEGA WATER RECLAMATION PLANT

a. Project Summary. A 75 mgd La Cienega Water Reclamation Plant (LCWRP) has been proposed to provide for maximum reclamation of wastewater now treated at HTP. The No Project Alternative would not include any construction for a La Cienega Plant.

The LCWRP would be built in the Culver City area but the City of Los Angeles does not presently own any acceptable site. Construction would occur during the years 1982-1985 provided that the proposed 25 acre site (or an acceptable alternative) could be acquired by that time. Approximately 982 manyears of direct labor would be required for construction. Construction costs would be $56,189,000. Service would be provided by upgraded HTP facilities, by the newly constructed SF, and by existing LA-GWRP facilities until LCWRP was completed and tied into the system. No interruption of service would be caused by construction of LCWRP.

b. Impacts on Physical Elements of the Environment.

(1) SOILS AND TOPOGRAPHY. The proposed 25-acre site for the La Cienega Water Reclamation Plant is already developed and covered by a major structure and parking lot. Demolition of these facilities will be required but there will be essentially no change in topography. Dust will be generated during demolition and final grading of the site and some potential exists for erosion should rainfall occur during the grading activities. Demolition debris will be transported off-site for disposal. No need for off-site disposal of soil is anticipated.

(2) HYDROLOGY AND WATER QUALITY. The quantities, sources and disposal of water which will be needed during the construction period for settling dust, washing equipment and mixing concrete have not been determined. Measures should be taken to prevent runoff from entering Ballona Creek. If adequate measures are taken to control construction phase runoff and percolation of pollutants, no impacts on water quality are expected during the construction phase.

(3) AIR RESOURCES. Air quality will be adversely affected during the construction phase due to vehicle emissions and dust and odor generation associated with construction activities. Demolition will be the major source of dust. Vehicle emissions will result from truck trips required to dispose of demolition debris and deliver materials, from operation of construction equipment on-site, and from operation of commuting construction workers' vehicles. There will be minor additional increases in emissions due to delays in local traffic caused by construction traffic. The total emissions expected as a result of construction of the La Cienega Plant have not been calculated.

Air pollutants generated during the construction phase are likely to cause minor nuisances in residential neighborhoods to the east, south, and west of the construction site. These are high density areas, combined with small commercial and industrial uses, so the potential exists for affecting a large population.

(4) NOISE AND VIBRATION. Construction traffic and demolition of existing buildings will be major sources of noise and vibration. Potential impacts will be thoroughly assessed after final site selection and project design. Appropriate mitigation measures will be recommended at that time.

c. Impacts on Biological Elements of the Environment.

(1) TERRESTRIAL RESOURCES. The existing La Cienega site supports essentially no terrestrial biological resources. Occasional weedy plants grow around the periphery of paved areas and buildings, and these will be displaced during construction. Similarly, the few species of birds utilizing the highly urbanized habitat will be displaced. There is no possibility that any rare or endangered species or habitats exist in the proposed project area.

(2) AQUATIC RESOURCES. Ballona Creek is adjacent to the western border of the proposed site. The creek is lined with concrete rubble above Sawtelle Blvd. and downstream has concrete sides with a mud bottom. The daily flow at Sawtelle Blvd. ranged from 18.4 to 482 mgd in 1974. Because of the large fluctuations in flow, there are probably no significant aquatic resources in this portion of the creek. If precautions are taken to prevent pollutants from entering Ballona Creek and being washed downstream into Santa Monica Bay, there will be no construction phase impacts on aquatic resources as a result of the La Cienega facility.

d. Impacts on Socioeconomic Elements of the Environment.

(1) LAND USE AND AESTHETICS. The proposed project would convert the site of a FedCo Discount store and parking lot to that of a sewage treatment facility. A change in zoning from M-2 to M-3 will be required. FedCo is a major membership shopping facility and the store probably will be reestablished elsewhere. Since the future site of FedCo is unknown, it is not possible to predict whether or not there would be any serious inconvenience to present users or employees.

Land uses adjacent to the project site will be indirectly affected by noise and air pollutants generated during the construction period. The extent of these impacts has not been determined.

(2) POPULATION. As with other construction projects, it is unlikely that workers would relocate in order to seek employment at the site. There is a possibility that families with wage earners working at the FedCo store might relocate out of the area following termination of employment opportunities. This potential has not been examined.

(3) EMPLOYMENT. Construction of the La Cienega facility would provide employment for construction workers and would terminate employment for workers at the existing FedCo store. Since FedCo would be expected to open a new store, no major change in employment opportunities

would result from elimination of the present facility; however, some individuals employed at the present location may not be able to continue employment at a new facility. The construction project will require about 982 manyears of labor which may produce 1,800 jobs of one month to 4 years' duration. The average daily number of construction jobs anticipated for the La Cienega project is approximately 600.

(4) ECONOMY. Local economies may be affected by the change in location of the FedCo facilities. If the store relocates in Culver City, the City of Los Angeles will lose major sources of tax revenue. Relocation in Culver City would result in increases in property tax and sales tax revenues in Culver City.

Construction employment will add approximately $28,094,500 in wages (1975 dollars) to the local economy over the 4-year construction period.

Financing for the La Cienega Water Reclamation Plant will be similar to financing for other projects.

(5) COMMUNITY SERVICES. Any shift in population caused by the relocation of the FedCo store might have an impact on the use of community services. However, it is unlikely that relocation of employees would be sufficiently numerous to have any noticeable effect. Construction workers are not expected to relocate.

Truck traffic, noise, and air pollutants generated during the construction period have a potential for adverse impacts on community services. The extent of this impact will be examined during the final site selection process.

(6) UTILITIES. Construction of the La Cienega sewage treatment plant will not affect treatment current at the time of construction. Sources of power and water needed during construction have not yet been determined.

(7) ENERGY USE AND CONSERVATION. Consumption of electricity and fossil fuel during the construction period have not been estimated.

(8) TRANSPORTATION. Construction of the La Cienega facility will eliminate the traffic currently generated by the FedCo store but will increase construction-related traffic. Commuting construction workers will add traffic during peak periods. Loss of FedCo traffic will diminish automobile traffic primarily during the middle of the day and on weekends and evenings. The truck trips required for disposal of demolition debris will occur throughout the working day. The number of truck trips and destinations are not known but some adverse impacts on local traffic can be expected.

(9) AREAS OF SPECIAL SIGNIFICANCE. Because of present urbanization of the project site it is highly unlikely that any archaeological or paleontological resources of significance exist on the surface. However, a number of prehistoric animal skeletons have been unearthed from the immediate project vicinity and a very strong likelihood of further subsurface discoveries exists. No known historical monuments are located proximal to the proposed plant site. No significant biological resources are in the immediate area.

5. EAST VALLEY INTERCEPTOR SEWER

a. Project Summary. The East Valley Interceptor Sewer (EVIS) project has been proposed as the best system for delivering San Fernando Valley sewage to the proposed SF. If the SF is constructed, then EVIS must also be constructed, and the magnitude of the EVIS project must match the capacity of the SF. When the initial 40 mgd SF is built, EVIS Unit I will serve it. If SF is expanded as described in Section VIII.A.2.a, then EVIS Unit II will be added to provide influent compatible with the ultimate 85 mgd capacity of the SF. If the SF is not constructed, the No Project Alternative will also apply to EVIS.

EVIS Unit I would be constructed during 1978 and 1979. It would originate on Hart St. at Woodman Ave. and would be constructed to transport sewage by gravity flow to the SF. Unit II, to be constructed during 1982 and 1983 would join Unit I at Woodman Ave. and Hart St., and would extend up Woodman Ave. and Lassen St. as far as Lemona Ave.

For construction of Unit I, direct labor requirements would equal about 135 manyears. Construction costs would be approximately $7,731,000. For construction of Unit II, direct labor requirements would be about 80 manyears, and costs about $4,604,000.

Service would be interrupted for brief periods while the new interceptors were being tied into each existing sewer line.

b. Impacts on Physical Elements of the Environment.

(1) SOILS AND TOPOGRAPHY. There will be no impact on topography from construction of either Unit I or Unit II of EVIS. Soil will be removed from trenches in order to lay pipe. Some of this soil will be backfilled but a volume equal to the volume of the pipe and bedding materials will need to be removed from the project site. Disposal areas for this soil have not been determined. Because pipes will be laid under existing streets, disturbance of the soil will have no significant impact. Minor amounts of dust will be generated during the construction period and precipitation could result in minor erosion of excavated earth.

(2) HYDROLOGY. Water use for the project has not been determined. Any runoff from the project site could carry silt and other pollutants into the storm sewer system which eventually discharges to the Sepulveda Flood Retention Basin. Any contribution of the construction project to pollutants in storm water should be trivial.

(3) AIR RESOURCES. Minor impacts on air quality will result from vehicular emissions and dust and odors generated during construction. Construction equipment and commuting construction workers' vehicles will increase exhaust emissions in the immediate project area. The magnitude of this increase has not been calculated but is not expected to be noticeable. The potential for dust generation is minor and simple control measures probably will eliminate problems. Sewage odors may be released for short periods of time when existing sewer lines are connected into the interceptor.

Vehicle emissions will also be increased by delays in local traffic caused by installation of the interceptor sewer. One lane of traffic on Woodman Avenue will be eliminated and cross streets will be blocked for short periods of time. Motorists will occasionally be delayed and be required to take longer routes, thereby increasing total vehicle emissions.

(4) NOISE AND VIBRATIONS. Construction activities and increases in traffic due to construction will generate noises in the project area. Removal of existing pavement will require the use of jackhammers and will produce loud noises in the immediate area of activity. This level of noise can be expected to be an annoyance to local pedestrians, shopkeepers, and residents, but will be of short duration. The project area should be surveyed for any special uses which may be particularly sensitive to noise and vibrations.

c. Impacts on Biological Elements of the Environment.

(1) TERRESTRIAL RESOURCES. Construction for EVIS Units I and II will occur entirely along commercial streets. There will be little if any disturbance of existing vegetation or wildlife.

(2) AQUATIC RESOURCES. There is very little chance of any construction-related impacts on aquatic resources. Precautions taken to prevent washing of soil into storm sewers should eliminate the possibility of any construction phase impact on aquatic resources.

d. Impacts on Socioeconomic Elements of the Environment.

(1) LAND USE AND AESTHETICS. Construction of EVIS Units I and II will cause temporary interference with existing land uses along the construction corridor. Traffic patterns and parking will be temporarily disrupted. Use of sidewalks may be limited and access to existing shops and other buildings will be affected. Since the construction process will progress along the proposed route, inconvenience will be localized and temporary. Aesthetic impacts, although of short duration, will be significant because of the close proximity of construction to existing land uses.

(2) POPULATION. No relocation of construction workers is expected as a result of this project. Similarly, no relocation of residents in the area is expected to result from the construction phase of the project.

(3) EMPLOYMENT. The 135 manyears of labor required for the construction of EVIS Unit I will provide approximately 200 jobs of one month to two years' duration. The average daily number of construction jobs will be approximately 100. Following the two-year construction period for EVIS Unit I, there will be a two-year period before initiation of construction on the EVIS Unit II. The two year construction period anticipated for EVIS Unit II will provide essentially the same job opportunities as during construction of Unit I.

(4) ECONOMY. Construction employment will add 3,865,500 dollars in wages to the local economy over the initial two year (1978 and 1979) construction period for Unit I, and another 3,302,000 dollars for construction of Unit II in 1982 and 1983.

(5) COMMUNITY SERVICES. Community services in the immediate project area would be affected by construction of EVIS Units I and II. Any potential limitations on access to schools, hospitals, fire stations, or other facilities offering important community services should be examined prior to implementation of the project. It is probable that mitigation measures can be implemented to prevent any serious impact on the use of these community facilities. Inconvenience may also be caused by interference with parking, limitations of visibility of shops to passing motorists, interference with existing traffic patterns, and noises generated by construction activity.

Because construction workers are not expected to relocate in order to obtain employment on these projects, there will be no increases in use of local community facilities due to project-related shifts in population.

(6) UTILITIES. Some existing utilities in the project area are located underground. Construction of EVIS Units I and II could cause interruption in services to other utilities users. The duration of such interruptions and the possible need for alternate sources of power, water or other utilities will be examined during detailed project planning.

(7) ENERGY USE AND CONSERVATION. Construction related use of fossil fuels and consumption of electicity have not been calculated.

(8) TRANSPORTATION. Construction of EVIS Units I and II will have serious local impacts on traffic. The blocking of some existing lanes of traffic and of cross streets will cause delays and some detours. Additional traffic will be generated during peak hours by an average of 100 commuting construction workers. Some truck traffic will be generated by the need for disposal of torn up pavement and excavated soil and the requirements for delivery of materials. The amount of truck traffic and spoil disposal sites have not been determined. Prior to construction, the project area should be surveyed for any facilities requiring emergency access. The city will provide additional personnel to aid in traffic control as necessary.

(9) AREA OF SPECIAL SIGNIFICANCE. No known archaeological or historical sites have been recorded in the vicinity of the proposed project corridor. The trench alignments are not expected to directly disturb any surface paleontological resources. There is, however, a strong possibility that subsurface sites could be unearthed by construction of these units. Paleontological discoveries have been made near the Unit II corridor and may indicate the presence of other buried fossils.

6. ADDITIONAL VALLEY OUTFALL RELIEF SEWER

a. Project Summary. The Additional Valley Outfall Relief Sewer (AVORS) would be needed to provide expanded service to the San Fernando Valley in the near future if the SF is not constructed. The AVORS would include a new tunnel through the Santa Monica Mountains providing 85 cfs of additional capacity for carrying San Fernando Valley sewage into the HTP system. The No Project Alternative to AVORS is no construction of a new tunnel.

The proposed AVORS would connect with an existing 5-mile segment already constructed east of Sepulveda Dam. A tunnel would be used through the Santa Monica Mountains (about 55,000 feet) and trench (primarily) would bring the sewer to its connection with the NCOS in Culver City. AVORS would be constructed in 1977, '78, and '79 with a total direct labor requirement of approximately 741 manyears. Construction costs would be $42,377,000. Some overloading of the present tunnel and NCOS-NOS system could be expected prior to completion of AVORS, but construction of AVORS would not cause any interruption of service.

Impacts resulting from the trenching portions of AVORS construction would be the same as those described for construction of EVIS. This section describes the impacts of only the tunneling activities.

b. Impacts on Physical Elements of the Environment.

(1) SOILS AND GEOLOGY. Both trenching and tunneling will be used in construction of the AVORS. Impacts on soils due to trenching will be the same as those described for the construction of the EVIS. The tunnel through the Santa Monica Mountains will be drilled using a tunnelling machine. This process will break up existing rock and soil in the path of the tunnel and will produce debris that will require disposal at a spoil site. A disposal site has not yet been identified. Ventilation of the tunnel during construction may result in some dust being released from the mouth of the tunnel. A potential for erosion will exist at either end of the tunnel and at the spoil site.

(2) HYDROLOGY. Water will be needed for settling dust, washing equipment, and other construction purposes. The sources, treatment and final disposal of this water have not been determined. Runoff from the construction or spoil site could carry silt and other pollution into nearby streams or drainage channels. Any seepage into the tunnel which then drains to the surface could also carry pollutants into surface waters. The tunnel could interfere with subsurface drainage patterns by crossing impermeable barriers between aquifers or by draining water tables.

(3) AIR RESOURCES. Air quality will be adversely affected by emissions from construction equipment and construction workers' automobiles. Minor emissions from tunnelling operations will be exhausted at the tunnel entrance. Construction vehicles will also be concentrated at the tunnel entrance. Total emissions from construction activities have not been calculated.

(4) NOISE AND VIBRATION. Tunnelling equipment will cause considerable noise and vibration near the surface when operating at either end of the tunnel. Additional noise will be generated by operation of other construction equipment, by hauling of spoil to the disposal site, and by traveling of construction workers. Ambient noise surveys should be conducted near both ends of the tunnel and noise impacts of the tunnelling should be predicted when the type of equipment and the schedule are being determined.

c. Impacts on Biological Elements of the Environment.

(1) TERRESTRIAL RESOURCES. Sites which are proposed for tunnel entrances do not include any natural or otherwise significant habitat. No notable primary impacts will affect terrestrial biological resources unless surface access to the tunnel is required along the proposed route.

(2) AQUATIC RESOURCES. If the proposed tunnel interferes with existing groundwater distribution patterns, there is a possibility of changing the flow characteristics of springs. This, in turn, would affect plants and animals living in the springs and spring-fed waterways. Similarly, any pollutants entering the groundwater could adversely affect aquatic resources of surface waters being fed by this groundwater. Precautions also must be taken to prevent silt and other pollutants from directly entering surface waters and thereby adversely affecting aquatic resources.

d. Impacts on Socioeconomic Elements of the Environment.

(1) LAND USE AND AESTHETICS. Construction of the tunnel for AVORS will displace existing land uses only at the tunnel entrances and at the site selected for disposal of spoil from the tunnelling operation. Minor impacts on adjacent land uses can be expected from noise, vibrations, and air pollutants generated during the tunnelling activities.

(2) POPULATION. No relocation of construction workers is expected for this project. There should be no impact of the construction of AVORS on population distribution.

(3) EMPLOYMENT. The 711 manyears of labor required for AVORS construction will provide approximately 1,400 jobs of one month to three years' duration.

(4) ECONOMY. Expenditures for construction of AVORS will add approximately 21,188,500 dollars in wages to the local economy over the three year construction period. Financing for the project will be the same as that discussed for other elements of the facilities plan.

(5) COMMUNITY SERVICES. No disruption of community services is expected as a result of the tunnelling portion of the AVORS project. Other disruptions will be similar to those discribed for the construction of EVIS.

(6) UTILITIES. Power, water, and other utilities needed for tunnelling are expected to be available from local sources without taxing existing systems. No interruptions of service are expected as a result of the tunnelling.

(7) ENERGY USE AND CONSERVATION. Energy consumption for the construction of AVORS has not been calculated.

(8) TRANSPORTATION. The tunnelling portion of the AVORS project will affect transportation by increasing truck traffic needed for the disposal of tunnelling debris and delivery of supplies. Roughly 600 commuting construction workers will add to traffic levels on local streets. Interference with existing traffic patterns is expected to be localized at tunnel entrances. Traffic interference resulting from construction of the trenched portions of AVORS will be similar to that described for construction of EVIS.

(9) AREAS OF SPECIAL SIGNIFICANCE. The tunnelling project presents potential for discovering paleontological resources. Sites of recorded discoveries exist on the north slope of the Santa Monica Mountains and the south slope is considered to be an area likely to yield unrecorded sites. No known archaeological sites exist along the tunnel corridor.

Two historical sites, the Metro-Goldwyn-Mayer Gates and the Desilu Studio in Culver City, are close to or within the immediate site of the open trench alignment where it crosses Washington Boulevard. Because the trench route follows existing streets these two structures are unlikely to be adversely affected. Approximately 22 historical structures are located along the western boundary of the City of Beverly Hills. These sites are not officially designated but rather, are part of a longer list of "sites of historical and archaeological interest" prepared by the Planning Department of Beverly Hills (Beverly Hills, Planning Department, 1977). The distance of the sites from the proposed AVORS tunnel route precludes the probability that their locations would be affected unless construction affects traffic in such a manner as to interfere with access.

No significant biological resources occur at the location of either entrance to the tunnel. Some important resources may occur along the surface of the tunnel route and would be disturbed if construction includes any surface access between the tunnel entrances.

7. WOODMAN AVENUE RELIEF SEWER

a. Project Summary. The Woodman Relief Sewer would be constructed along Woodman Avenue in the same location as proposed the EVIS Unit II. The purpose the the sewer is to provide hydraulic relief to the service area and to connect this service area with AVORS. The Woodman Avenue Relief Sewer would be constructed only if AVORS were constructed. The construction period would be during 1982 and 1983 using a total of 47 manyears direct labor. Construction costs would be 2,672,000 dollars.

b. Project Impacts. The construction phase impacts for building the Woodman Avenue Relief Sewer would be identical with the impacts for construction of EVIS Unit II.

8. SEPULVEDA WATER DELIVERY SYSTEM

a. Project Summary. If the SF is constructed, a water delivery system is proposed to provide for irrigation of golf courses and a park in the Sepulveda Dam Recreation Area. This system would deliver about 9 mgd of treated effluent from SF to the proposed use areas. The No Project Alternative would apply if SF were not constructed or if other uses for the reclaimed water took precedence.

The delivery system would be constructed in 1980 with about 13 manyears of direct labor. Construction costs would be $758,000. Construction would in no way interfere with service of the SF scheduled to begin in 1980.

b. Impacts on Physical Elements of the Environment. Installation of piplines for the delivery and distribution of irrigation water would cause minor disturbances associated with the excavation of soil and laying of pipeline. Minor amounts of dust would be generated and vehicular emissions would be increased due to construction activity and commuting of construction workers. A minor potential would exist for siltation of the Los Angeles River where one of the delivery pipes crosses the river channel. Some noise would result from construction activity and could cause minor disturbances to people using golf courses and parks in the area.

c. Impacts on Biological Elements of the Environment. Construction of the proposed pumping station immediately south of the first 40 mgd module for the Sepulveda Water Reclamation Plant and installation of the delivery pipelines would cause disturbance to existing terrestrial habitats. Part of the area is now in agricultural use. Other portions are developed as golf course and picnic areas, and presently undeveloped sites are proposed as future golf courses. The installation of piping through these areas is not expected to disturb any significant terrestrial biological resources. Aquatic resources would be affected only through discharge of pollutants into the Los Angleles River channel. This potential can be avoided by crossing the channel during the dry season and by taking precautions to avoid runoff from adjacent excavated areas.

d. Impacts on Socioeconomic Elements of the Environment. Portions of the golf courses where pipe is being installed will not be usable during the construction phase. The duration of this portion of the project probably will be limited to a few months. Some disturbance of traffic will occur along Woodley Avenue where two major distribution pipes cross the highway. Detours may be required during this stage of the construction.

No impacts on population, community services, or utilities are anticipated. Approximately 20 jobs of short duration will result from the construction of the water distribution system. This will add 1,336,000 dollars in wages (1975 dollars) to the local economy.

Energy use for the construction phase has not been estimated.

The project area and immediate vicinity have previously yielded paleontological and archaeological resources signifying the possible repetition of such discoveries during construction of the project. In addition, two historical sites, an oak tree on Louise Avenue and Rancho El Encino on Moorpark Avenue, are adjacent to the project area, and may possibly be affected by construction of water mains connected with the Sepulveda Reclaimed Water Delivery System.

9. GRIFFITH PARK DELIVERY SYSTEM

a. Project Summary. The Griffith Park Delivery System is designed to carry 9 mgd of reclaimed water from the existing LAG to Griffith Park for irrigation. This project is proposed to be constructed with each of the possible project alternatives for providing full secondary treatment. Similarly, a decision not to construct the Griffith Park Delivery System could be made independently of any other selection of alternatives.

The delivery system is proposed for construction in 1977 and 1978, and will require direct labor equivalent to 14 manyears. Construction costs are estimated to be $819,000.

No interruption of existing treatment service would result from construction, but operation would result in irrigation with water that would otherwise be discharged into the Los Angeles River.

b. Project Impact. Details of the Griffith Park Water Delivery System will be developed in the park master plan presently in preparation. Installations of the piping, water reservoir, and pumping station can be expected to have impacts similar to those described for the Sepulveda Water Delivery System. Construction of the reservoir probably will require off-site disposal of excavated earth.

The provision of 14 jobs for the two year construction period will add approximately 409,500 dollars in wages (1975 dollars) to the local economy. Financing will be the same as that described for other portions of the Facilities plan.

10. SLUDGE DISPOSAL

a. Project Summary. The Interim Sludge processing and disposal program for Hyperion Treatment Plant is presently designed to treat the sludge separated in the treatment process and dispose of it on land so that discharges to the ocean may be terminated in accordance with the Ocean Plan. The project is scheduled to proceed in two phases (Ujiie, 18 March 1977). Phase I is to begin in August 1978 and will continue until April 1980 when Phase II becomes operational. For the first phase, 25 percent of the present sludge will be removed from the system, digested, and centrifuged in a solid bowl centrifuge. Ninety percent of the solids are captured by this process and will be disposed of in a landfill. The centrate will then go to the pilot study test of the Carver-Greenfield process which evaporates the centrate. The resulting solids would also be landfilled. Phase II is designed to remove the remainder of the sludge by the same process as in Phase I. If the pilot study results are favorable, no centrate will be recycled through the treatment plant or discharged directly to the ocean mixed with the 5-mile effluent as previously planned.

Construction costs will be $14,007,000 in 1975 dollars, and 245 man-years of labor will be required.

b. Project Impacts. Construction of interim sludge disposal processing equipment will occur in conjunction with each of the alternative construction scenarios for HTP. Impacts of the Interim Sludge Processing and Disposal Program are being addressed in a separate study. Only impacts on the marine ecosystem are addressed here. Construction phase sludge disposal impacts on the marine environment will be approximately 25 percent less than with continuation of discharge in the No Project Alternative (sludge discharge through the 7-mile outfall) until 1980. This is dicussed in Section VIII.A.1. Operation Phase Primary Impacts, No Project Alternative.

11. TERMINAL ISLAND TREATMENT FACILITIES

Upgrading and expansion of the City of Los Angeles Terminal Island Treatment Facilities is currently being initiated under a separate project report and EIR. The proposed project will provide for full secondary treatment of effluents. The project is entirely separate from that being examined for the HTP system and the impacts will not be discussed in this report.

12. ADDITIONAL PROJECTS COMMON TO ALL ALTERNATIVES

The Facilities Plan lists 44 projects of minor significance and 16 projects of significance in addition to the alternatives described in Chapter VII of this report. All of the projects are part of the 1977-1982 Five-Year Capital Improvement Program. The additional significant projects include proposals to relieve local hydraulic problems, to treat zoo wastes, to study infiltration problems, and to rehabilitate and modernize several facilities. Reconstruction of the NOS under the Los Angeles River is proposed to halt exfiltration. Planning is also proposed for eventual replacement of the NOS in the badly deteriorated segment near HTP. Construction of these two specific projects would solve problems discussed in the Facilities Plan.

The 44 minor projects are listed briefly in the Facilities Plan. These are for installation of sewer pipes of less than 24 inch diameter to meet local needs.

Details of the additional projects proposed in the Capital-Improvement Program are not presented in the Facilities Plan and impacts are not discussed in this report.

B. operation phase primary impacts

B. OPERATION PHASE PRIMARY IMPACTS

The Facilities Plan alternatives considered in this section are as follows:

- No Project (A1)
- Inland/Coastal Split of Treatment Capacity (B4C)
- Coastal Capacity with Relief Sewer for the San Fernando Valley (C3)
- Inland/Coastal Split with Maximum Potential for Water Reclamation (E2)

The elements of each of the alternatives and the periods of operation are given on Table VIII-1 at the beginning of this chapter. Table VIII-11 summarizes operational costs for each major alternative. This section describes primary impacts due to operation and maintenance of each major alternative.

Table VIII-11. Primary economic impact summary of operations for five alternatives.

	NO PROJECT	B4C	C3	E2
Total Cost	$253,390,000	$452,561,000	$402,734,000	$511,061,000
Present Worth	104,934,000	189,627,000	168,670,000	207,684,000
Direct Payroll	96,510,000	139,703,000	118,290,000	154,553,000
Direct Manyears	6,434	9,313.7	7,886	10,304

1. NO PROJECT ALTERNATIVE (A1)

a. Project Summary. The only changes to existing conditions that would result from the No Project Alternative are modernization of Hyperion treatment facilities and an increase in capacity of Hyperion to provide secondary treatment up to 200 mgd. No new construction would be undertaken

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at any other site, and no change would be implemented in sludge disposal procedures. (The Interim Sludge Processing and Disposal Program has not been included in this No Project discussion but can be implemented with or without any other project elements). Only minor repairs and maintenance would be made as necessary to maintain existing systems. Existing facilities and operations are described in Chapter I. In place of improved or expanded facilities, it must be assumed that areas experiencing overloaded sewer and treatment systems would be required to restrict growth or otherwise place limitations on the expanded use of sewer systems. Federal and State requirements to provide full secondary treatment and to terminate ocean disposal of sludge would be violated under the No Project Alternative. Table VIII-12 gives operation and maintenance costs for the No Project Alternative.

b. Impacts on Physical Elements of the Environment.

(1) SOILS AND GEOLOGY. Selection of the No Project Alternative would result in no change to existing impacts on soils and geology. Screened material from the primary stage of treatment at Hyperion and LA-GWRP would continue to be disposed of in landfills. No significant increases in volume of material requiring landfill would occur.

(2) HYDROLOGY. Both the Hyperion facility and L.A.-Glendale Water Reclamation Plant (LA-GWRP) would remain fully operational during rainfall equivalent to a 250-year storm. Heavy rainfall in the service area does, however, create hydraulic problems in the existing sewer system and diminish the level of treatment provided by Hyperion. Continuation of these problems could be expected as discussed in Chapter V.

Operation of the existing system affects surface water quality and has the potential for affecting groundwater quality. The 20 mgd LA-GWRP is still under construction, and when the plant is completed approximately 18.5 mgd of tertiary effluent will be available for uses acceptable for reclaimed water. Half of the reclaimed water will probably be used by the City of Glendale in a steam generating plant. Under the No Project Alternative the City of Los Angeles' share of treated plant effluent (9 mgd) would be discharged to the Los Angeles River. Quantities percolating into the groundwater would become available for use indirectly along with other groundwater resources.

The expected quality of this effluent is shown in Table VIII-13. Since the Los Angeles River below the plant is unlined for 8 km (5 miles), there will be some percolation of tertiary effluent into the groundwater. The percolation rate for this area is approximately 0.4 m^3/sec (13 cfs),

Table VIII-12. Summary of operational costs for the No Project Alternative (A1)

ELEMENT	mgd	YEARS COVERED BY O&M	TOTAL O&M COST (1975 $)	O&M PRESENT WORTH	TOTAL O&M DIRECT MY LABOR	TOTAL O&M PAYROLL
HTP Secondary+Modern.	200*	1976 - 2000	$235,390,000	$104,934,000	.6434	$96,510,000

*1976 through 1981 were costed at $7,565,000 per year (per Facility Plan plus info 1977-81 was changed to 77-82 as construction period + O&M (new) 1982 - 2000 Present worths may differ from some in Facility Plan since Facility Plan at times ascribed discount rate to entire cost of multi-year project at the starting year only.

Table VIII-13. Predicted effluent characteristics for LA-GWRP, SWRP, and LCWRP (DPW, 1976; CLA, 1977).

CONSTITUENT	CONCENTRATION (mg/l)[1]	
	LAGWRP & SWRP	LCWRP
BOD$_5$	5[3]	5[3]
COD	25[3]	25[3]
Oil and Grease	< 10	
Settleable Solids	< 0.1[2]	
Suspended Solids	< 5[3]	< 5[3]
TDS	500[3]	650[3]
Total Hardness (CaCO$_3$)	95[3]	130[3]
Alkalinity (CaCO$_3$)	120[3]	165[3]
Turbidity (TU)	7[2]	
Color (Color Units)	35[2]	
Threshold Odor No.	0[2]	
pH (no units)	7.7, 7.4[3]	7.4[3]
Phenols	0.01	
Detergents - MBAS	< 0.5	
Phosphate (ortho)	10[3]	10[3]
Ammonia Nitrogen	10[3]	10[3]
Nitrate Nitrogen	5[2]	
Nitrate-Nitrite Nitrogen	0[3]	0[3]
Total Nitrogen	6.7	
Total Kjeldahl Nitrogen	10[3]	10[3]
Cyanide	< 0.02	
Arsenic	0.04[2]	
Boron	< 1	
Fluoride	0.8[2]	
Chloride	48	
Chloride + Sulfate	151[2]	
Sulfate	59	
Barium	0.00[2]	
Cadmium	0.01	
Copper	0.04	
Chromium, total	0.01	
Chromium, hexavalent	0.03[2]	
Nickel	< 0.09	
Mercury	< 0.001	
Lead	< 0.05	
Selenium	0.05	
Silver	0.05	
Zinc	0.08	
Radium-226 (pCi/l)	0.24[2]	
Strontium-90 (pCi/l)	1.1[2]	
Total β-activity (pCi/l)	22.1[2]	
Total α-activity (pCi/l)	1.06[2]	
Fecal Coliform Bacteria (MPN/100 ml)	2.2[2]	
Sodium Absorption Ratio	4.5[2]	

NOTE: Discrepancies such as those for chromium and chloride + sulfate are a result of analyses in different years.

[1] Unless otherwise noted, values based on June 1976 analysis.

[2] Based on 1968 analysis.

[3] From CLA (1977).

but the actual amount of discharged effluent that could enter the groundwater has not been determined. The quantity of effluent that could reach the groundwater will depend on the volume discharged, dilution by existing flows in the river, and areal extent of permeable bottom covered. The volume of effluent discharged will vary both daily and seasonally in addition to variations caused by reclamation uses. If none of the effluent were reclaimed, the volume discharged would average 18.5 mgd (0.8 m^3/sec) which exceeds the percolation rate by a factor of 2. Dilution of the effluent by existing flows in the river, effluent flows of less than 0.4 m^3/sec, and incomplete coverage of the permeable portion of the river bottom would all act to decrease the amount of effluent entering the groundwater.

The potential impacts to groundwater quality from this input of tertiary effluent are generally unknown. The constituents of concern are nitrates, viruses, organic compounds, and TDS. Concentrations of nitrate and TDS are lower in the effluent than in the river. Chlorination of effluent does not kill all viruses and also produces a variety of chlorinated compounds, some of which may be carcinogenic if ingested. Whether these constituents would contaminate the groundwater via percolation through the river bed is unknown.

Treated effluent not percolating into the groundwater will continue to flow down the Los Angeles River and be discharged into Los Angeles Harbor. Increasing the volume of water in the Los Angeles River is not expected to alter the natural flows substantially, particularly during wet weather when flows are normally quite variable (see Figures VIII-5 and VIII-6). In the unlined portion of the river (to 8 km below LA-GWRP), the low-flow section is quite large, and the combined natural and effluent discharges are not expected to exceed its capacity. Similarly, the addition of 9 to 18.5 mgd to the natural river flows is not expected to exceed the capacity of the low-flow section in the lined portion of the river down to Firestone Blvd. (approximately 24 km below LA-GWRP) during dry weather flows (Figure VIII-6). At Wardlow Road (approximately 38 km downriver from LA-GWRP), however, the addition of LA-GWRP effluent could result in the total discharge exceeding the low-flow section capacity for at least part of the dry weather season (see Figure VIII-5), particularly if 18.5 mgd is discharged from LA-GWRP.

The effects of increasing the discharge of the L.A. River on the size of the tidal prism are difficult to predict. During wet weather, the effects are probably indistinguishable from those caused by the variations in natural flows, but during dry weather, the size of the estuarine zone would be augmented by LA-GWRP discharges. No studies, however, have been done to relate river discharge to size of the estuarine zone and the increased size resulting from LA-GWRP effluent has not been accurately predicted. From Figure VIII-6 the dry weather natural river discharge

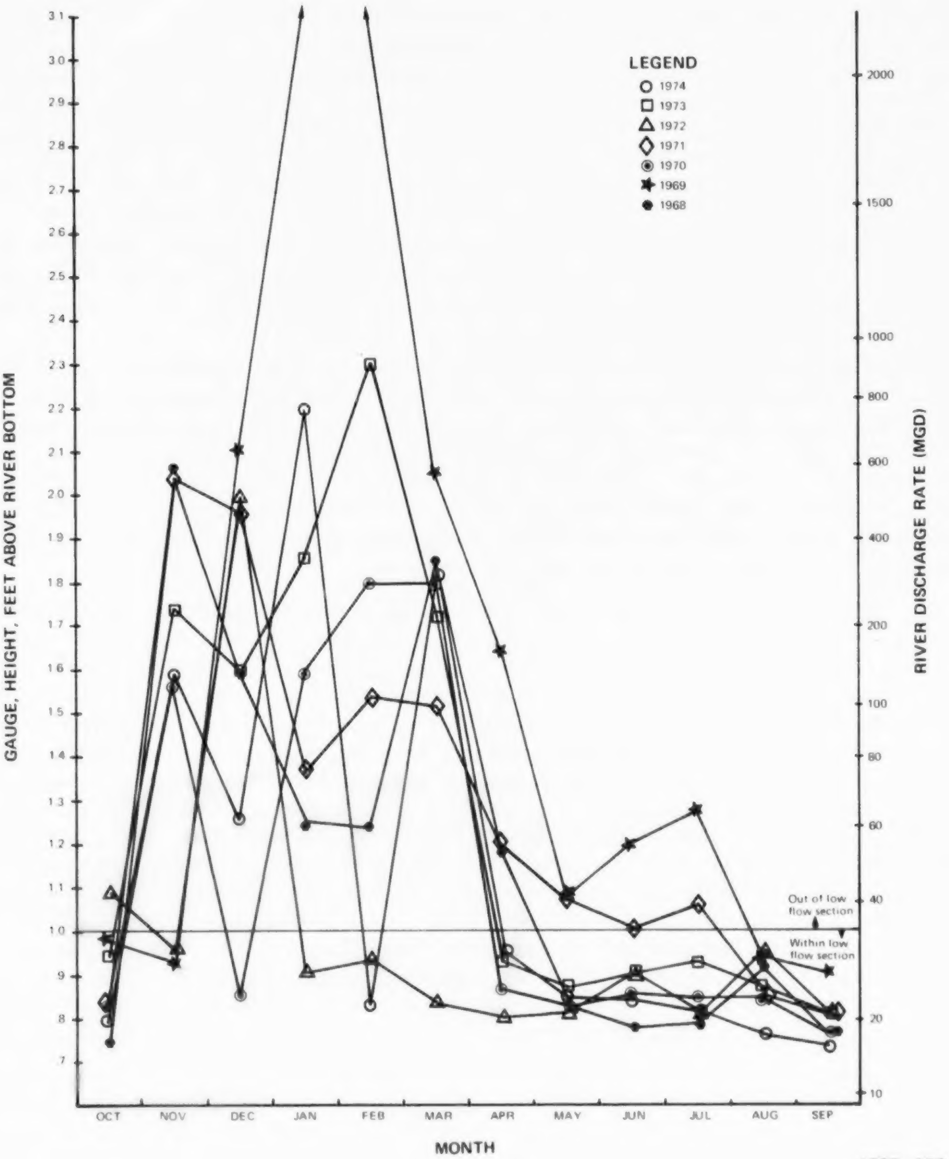

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Figure VIII-5. Average recorded monthly gauge height in the Los Angeles River below Wardlow Road (Station No. F 319-R) for the years 1968 through 1974 (data from Los Angeles County Flood Control District annual reports).

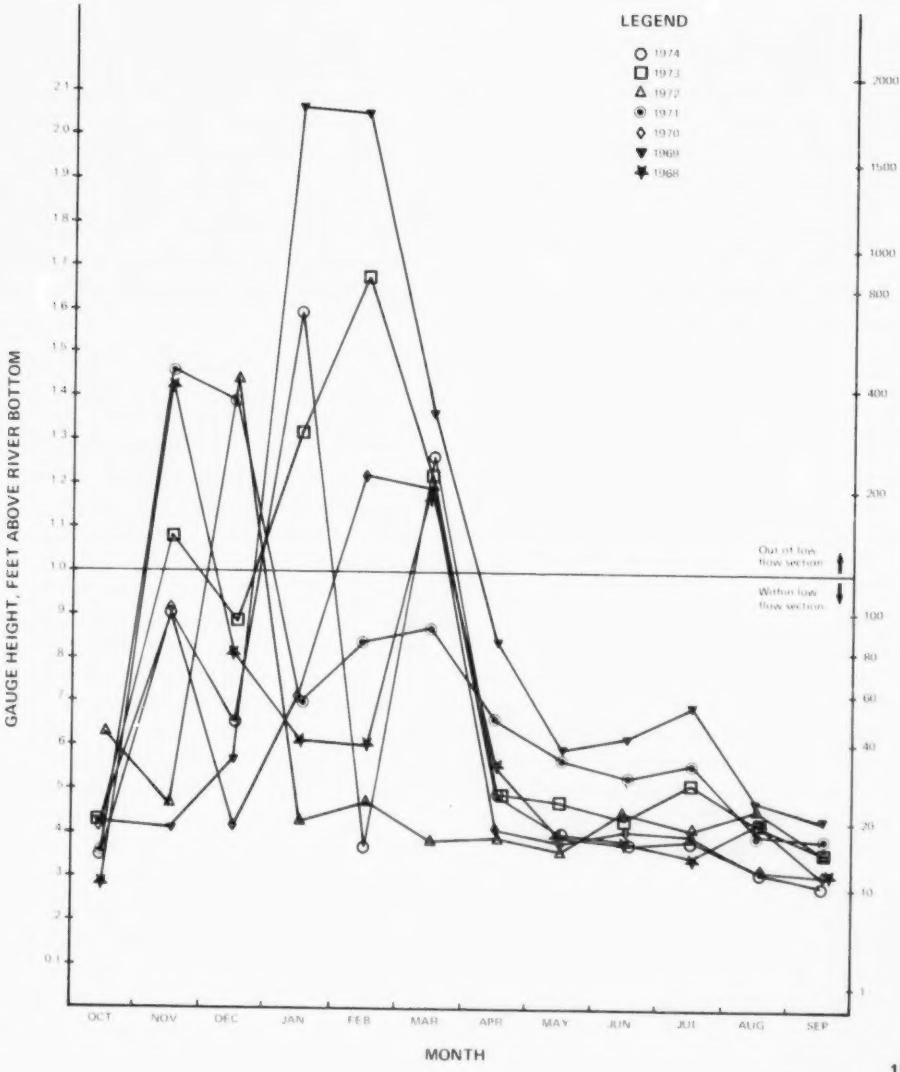

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Figure VIII-6. Average recorded monthly gauge height in the Los Angeles River below Firestone Boulevard (Station No. F 340-R) for the years 1968 through 1974 (data from Los Angeles County Flood Control District annual reports).

near the tidal prism is estimated to be 27 mgd. Thus, if 9 mgd were discharged from LA-GWRP, the volume of the freshwater wedge might be increased by one-third (two-thirds if 18.5 mgd were discharged from LA-GWRP).

The predicted effluent quality for LA-GWRP (Table VIII-13) is generally higher than that of the existing water in the L.A. River (see Chapter II) at Firestone Blvd. and Pacific Highway (lined section). Oil and grease concentrations, however, may be higher than those of the river. BOD in the effluent is lower than in the river which indicates that the effluent should not decrease the dissolved oxygen content of the river. Chlorination of the effluent will probably produce chloramines and other chloro-derivatives through chemical reactions with ammonia and organic compounds in the effluent. Overall, the addition of tertiary effluent from LA-GWRP to the L.A. River should not degrade the quality of the river water and may even improve it.

The maximum improvement of Hyperion facilities under the No Project Alternative will result in the discharge of up to 200 mgd of secondary effluent mixed with approximately 200 mgd of primary effluent. This effluent will be discharged through the 5-mile outfall. The effluent quality will depend on the quality of the influent, efficiency of the secondary treatment process, and amount of secondary effluent mixed with the primary effluent. A prediction of the effluent quality is presented in Table VIII-14, based on the assumptions that (1) influent quality remains constant, (2) primary treatment is the same as in 1974, (3) secondary treatment is the same as that predicted for the other alternatives, and (4) the final 5-mile effluent consists of 200 mgd secondary effluent and 214 mgd primary effluent. A comparison of these predicted values with the 1975 HTP 5-mile effluent quality in the same table shows that the concentration of some constituents increases while that for others decreases or remains the same. Table VIII-15 compares the 1975 HTP 5-mile effluent with the Ocean Plan standards. The effluent currently does not meet the 50 percent standards for 10 of 22 constituents and the 10 percent standards for 13 constituents.

The impacts of discharging the No Project effluent on the water and sediment quality of Santa Monica Bay are expected to be similar to those described in Chapter III for the present 5-mile effluent. The increase in effluent volume will increase the areal extent of the wastewater plume in Santa Monica Bay, as well as the mass emissions of some of the constituents (see Table VIII-18). Consequently, the environmental load of these substances will be enhanced more rapidly than is presently occurring.

Table VIII-14. Characteristics of the HTP 5- and 7-mile effluents in 1975 along with the predicted 5-mile effluent for No Project and full secondary treatment (HTP, 1976; CLA, 1976; Hoeptner, December 23, 1976).

CONSTITUENT	CONCENTRATION (mg/l)				OCEAN PLAN STANDARDS TO BE EXCEEDED < 50% OF THE TIME[4]
	5-MILE		7-MILE	5-MILE	
	1975[1]	PREDICTED[2] NO PROJECT	1975[1]	PREDICTED FULL SECONDARY[3]	
COD	250[5]	198	7,700[5]	70	
BOD	125	96	1,900[5]	15	
TSS	85	65	7,300[5]	25	50
TDS	870[5]	923	954[5]	904	
TS	953[5]	988	10,300	929	
pH (no units)	7.3	7.1	7.3	6.9	6 to 9
Oil and Grease	20	15.3	970	0.7	10
Phenols	0.04	0.04	0.29	0.02	0.5
Detergents (MBAS)	3.9	4.6	ND	1.27	
Organic Nitrogen	8.5	6.9	344	5.76	
Nitrite Nitrogen	0.07	0.02	ND	0.03	
Nitrate Nitrogen	0.16	0.17	ND	0.14	
Ammonia Nitrogen	13.9	16.4	300[5]	17	40
Silicate	19.1[5]	20	ND	21	
Phosphate Phosphorus	9	18	80	3.39	
Cyanide	0.14	0.2	0.67	0.11	0.1
Aluminum	0.55	0.57	ND	0.46	
Copper	0.19	0.17	16.8	0.11	0.2
Zinc	0.23	0.29	23.1	0.23	0.3
Iron	0.64[5]	0.61	78.7[5]	0.53	
Nickel	0.15	0.17	3.1	0.14	0.1
Lead	0.13	0.04	2.05	0.03	0.1
Arsenic	0.01	0.01	0.29	0.01	0.01
Cadmium	0.02	0.03	1.17	0.02	0.02
Chromium (+6)	0.00[5]	0.00	ND	0.00	0.005[6]
Chromium (+3)	0.13	0.21	11.7	0.14	
Manganese	0.02[5]	0.03	0.19[5]	0.03	
Selenium	0.02	0.03	0.27	0.019	
Mercury	0.002	0.003	0.108	0.02	0.001
Silver	0.02	0.03	0.80	0.019	0.02
Total Identifiable Chlorinated Hydrocarbons	0.00614	0.0018	0.02747	0.002	0.002

[1] Data from HTP (1976) and CLA (1976).

[2] Predicted assuming primary treatment of 214 mgd of 1974 quality + secondary treatment of 200 mgd with quality of last column.

[3] Prediction for UNOX.

[4] These are median values where the outfall concentrations are means. If the outfall values form a normal distribution about the mean, the mean is the same as the median.

[5] 1974 effluent quality.

[6] Total chromium.

Note: The data used to develop this table will be reexamined and the table revised. It is highly unlikely that the addition of 100 mgd of secondary for the No Project Alternative will result in increased concentrations as the table shows.

Table VIII-15. Comparison of the 1975 5-mile effluent with the Ocean Plan standards (DPW, 1976). The constituents that do not meet the standards are marked with an asterisk.

CONSTITUENTS	CONCENTRATION (mg/l)[1]			
	HTP 5-MILE EFFLUENT		OCEAN PLAN STANDARDS TO BE EXCEEDED	
	≤ 50% OF THE TIME	≤ 10% OF THE TIME	≤ 50% OF THE TIME	≤ 10% OF THE TIME
Grease and Oil	17.3[2]*	27.7[2]*	10	15
Floating Particulates	2.4*	6.0*	1.0	2.0
TSS	85.7[2]*	104[2]*	50	75
Settleable Solids (ml/l)	0.31[2]*	0.68[2]*	0.1	0.2
Turbidity (JTU)	54[2]*	63[2]	50	75
pH	7.3[2]	7.34[2]	6 to 9 at all times	
Phenols	0.1	0.50	0.5	1.0
Total Chlorine Residual	0	0	1.0	2.0
Ammonia Nitrogen	16.0	22.2	40	60
Cyanide	0.28*	0.45*	0.1	0.2
Arsenic	0.005	0.02	0.01	0.02
Cadmium	0.01	0.15*	0.02	0.03
Chromium (total)	0.24*	0.76*	0.005	0.01
Copper	0.15	0.31*	0.2	0.3
Lead	0.07	0.19	0.1	0.2
Mercury	0.0026*	0.0057*	0.001	0.002
Nickel	0.18*	0.37*	0.1	0.2
Silver	0.001	0.024	0.02	0.04
Zinc	0.28	0.73*	0.3	0.5
TICH	0.00131	0.00526*	0.002	0.004
Toxicity (tu)	1.25	1.47	1.5	2.0
Radioactivity (μCi/ml)	4.4×10^{-8}*	10.8×10^{-8}*	3×10^{-8}	3×10^{-8}

[1] All concentrations in mg/l unless otherwise noted and pH has no units.

[2] Based on mean values and assuming a normal distribution.

Under the No Project Alternative, digested sludge derived from the primary and secondary treatment processes would continue to be discharged to the ocean from the 7-mile outfall. The quantity of sludge will be larger than that presently discharged as a result of sludge from LA-GWRP being processed by HTP, increases in the volume of sewage treated, and increases in the amount of secondary treatment at HTP; thus, the volume or concentration of the sludge discharged must increase to account for the increased mass emissions. The constituent concentrations for the present 7-mile effluent are shown in Table VIII-14 and comparison with the concentrations for the 5-mile effluent in this table shows that the concentrations in sludge are almost always greater than those in the 5-mile effluent; consequently, the sludge will not meet the Ocean Plan standards. Furthermore, the continued discharge of sludge is in violation of the Ocean Plan. It should be noted, however, that the mass emission of each constituent from the 5-mile outfall generally exceeds that from the 7-mile outfall as a result of the much smaller sludge volume.

The impacts of continuing to discharge sludge to the ocean are predicted to be greater than those that have resulted from the present discharge because of the increased mass emissions and possible increased concentrations. The past impacts have been discussed in Chapter III and are summarized as follows:

- The impacts on the water quality of Santa Monica Bay are not well defined, particularly since the 5- and 7-mile outfalls are in close proximity to each other. The release of solids augments turbidity in the Bay. Most of the metals (> 90 percent) are associated with the particulates, and some mobilization may occur as the particulates mix with seawater, especially for nickel and cadmium.
- Benthic sediments have been substantially altered in an area approximately 2 km on a side and to a depth of over 30 cm. The percentage of the particulates released that remain in the vicinity of the outfall, however, are unknown. Numerous sludge constituents (BOD, COD, arsenic, cyanide, sulfides, volatile solids, heavy metals, and chlorinated hydrocarbons) have higher than background concentrations in the sediments near the 7-mile outfall. The ultimate fate of the discharged solids and their associated toxicants is also unknown, although currents may distribute them a considerable distance from the out-fall.

In the present system, raw sewage overflows periodically occur from the North Outfall Sewer (NOS) to Ballona Creek. A hydraulic relief overflow was constructed for the NOS at Jackson Ave. north of the intersection of Overland Ave. and Jefferson Blvd. in the mid 1950s. This structure operates automatically in response to excess pressure in the NOS, and the raw sewage released is chlorinated before entering Ballona Creek. The overflow is used intermittantly, averaging once or twice a year. From records since 1965 (Table VIII-16), it is predicted that the maximum overflow rate will be 110-120 mgd and the duration less than 15.4 hours. A major emergency bypass for the NOS also exists in the same area as the overflow structure. This was constructed in 1965 but has never been used. The purpose is for discharge of chlorinated raw sewage to Ballona Creek in the event of stoppage or breakage of the NOS or the shutdown of HTP facilities.

Water quality would be degraded considerably by discharges of chlorinated raw sewage to Ballona Creek even though the overflows generally occur when storm flows are highest. Chlorination of the raw sewage undoubtedly

Table VIII-16. Recorded flows from the Jackson Avenue overflow structure for the North Outfall Sewer (NOS) (CLA, 1976).

DATE	PEAK FLOW (mgd)	FLOW DURATION (HOURS)	TOTAL FLOW (mg)
22 November 1965	16	1.7	—[3]
29 December 1965	102	5.0	16.3
7 November 1966	6	2.5	—[3]
21 November 1967	8	1.5	—[3]
22 November 1967	—[1]	3.2	—[3]
25 January 1969	—[2]	—[2]	—[2]
23 February 1969	14	4.5	1.9
29 November 1970	126	7.0	21.1
24 December 1971	30	1.7	—[3]
7 January 1974	116	15.4	37.0

[1] No record due to power failures but a 40 mgd peak was estimated visually.

[2] No record but the peak flow apparently was very small.

[3] Insufficient data to calculate.

produces chloramines and other chloro-derivatives through chemical reaction of the chlorine with ammonia and organic compounds. Furthermore, bacterial conditions probably do not meet public health standards, and the high BOD and COD of the effluent may decrease the oxygen content in creek waters. Ballona Creek empties into Santa Monica Bay at Marina Del Rey, and thus, the sewage constituents could adversely affect the near-shore waters, particularly for bacteria.

Under the No Project Alternative, such discharges would continue along with their periodic degradation of water quality.

(3) AIR RESOURCES. The major primary impact of treatment operations upon air resources results from releases of odors at HTP. The modernization project which would be carried out under the No Project Alternative would correct this situation.

Other primary operational impacts on air resources include the release of pollutants from power generation facilities and from commuting plant operators' vehicles. Where sewer overflows occur during wet weather, problems of sewage odors would continue. Any growth of the service area would tend to increase the frequency at which these problems occur.

(4) NOISE. Selection of the No Project Alternative would result in no noticeable change to noise levels produced by existing facilities.

c. Impacts on Biological Elements of the Environment.

(1) TERRESTRIAL ECOSYSTEMS. Except for the continued moderate use of landfill sites, there would be essentially no primary impacts on terrestrial ecosystems due to implementation of the No Project Alternative. Secondary impacts such as changes in land use resulting from altered growth patterns are discussed in Chapter IX. In general, selection of the No Project Alternative would help to retain undeveloped property in its existing condition.

(2) AQUATIC ECOSYSTEMS.

(a) LAGWRP. The primary impact of the No Project Alternative to L.A. River biota will result from augmentation of river flow. During the rainy season (winter), discharge from LA-GWRP will amount to about 5-10 percent of the river flow, whereas during the dry season, river flow will be increased by about 30 to 70 percent. Thus, impacts upon river biota resulting from increases in river flow will be most important in the summer dry months. It is expected that this increase in dry summer flow will be well contained in the low-flow channel of the L.A. River down to Firestone Blvd., but as the low-flow channel capacity gradually decreases below Firestone Blvd., the augmented river discharge will probably cause summer overflows especially downriver from Wardlow Road (see Hydrology section). The biological importance of these overflow conditions will be to increase the exposed wetted channel surface area, thus creating more aquatic habitat in which odor causing algae and obnoxious insects may proliferate using the nutrient-rich water. The increased flow into the tidal prism will greatly increase and stabilize the fresh to salt water gradient downstream from Willow Street. Increase in size and stability of the estuarine zone of the L.A. River could benefit the establishment of a limited community of brackish water organisms, subject, however, to periodic purging by wet weather high flows. At present, the biota of the mixing zone is impoverished, having very low species diversity and density in the freshwater regions and essentially no biota characteristic of brackish water (see Chapter II). It is doubtful that many sessile brackish water benthos could survive the annual flushing of the estuarine zone, but certain estuarine plankton and nekton (fish and invertebrates) could survive. Emergent vegetation in the estuarine zone will probably remain unaffected by river flow increases due to LA-GWRP because most are euryhaline. Water quality in the LA River should not be degraded by addition of the LA-GWRP discharge (see Hydrology section), except that chlorination of the effluent will probably introduce toxic chlorinated hydrocarbons which could cause lethal or sublethal effects in some of the limited biota, either attached to substrates or drifting in the channel. Because the type and concentration of the individual chlorinated hydrocarbons produced cannot be predicted at this time, specific impacts cannot be assessed.

(b) HTP Effluent and Sludge. The effects of No Project upon the biota in Santa Monica Bay and the Southern California Bight will involve little change from the present impacts as described in Chapter III although volume and quality of effluent and sludge will change slightly by the year 2000 (see Hydrology section). The increased mass emissions from both outfalls will increase the potential for bioaccumulation in organisms.

The following is a summary of the present impacts which characterize the expected impacts from continued discharge of wastewater and sludge. The impacts of each discharge are difficult to separate since the outfalls are within a few km of each other, and thus, the impacts are generally summarized together for both discharges.

Distribution and Abundance of Organisms as Related to HTP Discharges:

- As would be expected, the distributions of some benthic organisms living in the sediments are correlated with the areas of known physical alteration. Apparently, there has been a substantial alteration in the biological characteristics of the bottom within the influence of the sludge outfall. The alteration is in the direction of decreased diversity (Figure III-C-16) and increased abundance (for some groups) and is by most definitions a degradation of the environment.

The distribution of individual species are plotted as isopleths from data for 1972, and the isopleths should be regarded as suggestive only. They show that some organisms (e.g., *Capitita ambiseta*) are concentrated in the vicinity of the 5-mile (wastewater) outfall (Figure III-C-20), and still others (e.g., *Axinopsida sericata*) avoid both outfalls (Figure III-C-23). From these data it can be inferred that effluent from both outfalls is influencing benthic ecology. Better resolution will be obtained when species-specific data from later years are thoroughly analyzed as well.

- The HTP effluent has been shown to periodically influence plankton in the surface waters of Santa Monica Bay with the zone of maximum plankton density moving offshore and decreasing after the 5-mile outfall went into operation. During most of the year, phytoplankton productivity was elevated in the surface waters over the outfall although the maximum productivity potential predicted from nutrient concentrations was not achieved, apparently as a result of the toxicants released with the nutrients. The occurrence of red tide blooms, however, shows no direct relationship to the HTP outfalls.
- In Chapter III, some calculations are made on the potential contribution of nutrients originating in the HTP effluent to the commercial fishery (Figure III-C-38). The calculations indicate the maximum amount of benefit that could occur as a result of the release of nutrients. The commercial fishery, however, has generally been declining for many years (Figures III-C-35 and 36) while the amounts of effluent have been increasing. It has been postulated that the decline in the fishery is attributable to overfishing although pollution and habitat degradation may also be of some importance.

Uptake and Toxicity of Sewage Constituents

- Concentrations of some metals in some benthic organisms were examined in 1972, and isopleths of these concentrations are included in Chapter III (Figures III-C-31 and 32). The data show accumulations of some metals that are related to the outfalls, but the data are suspect because the metals may have been in sediments ingested by the organisms rather than in their tissues. Mussels suspended in the water column near the HTP 7-mile outfall did take up DDT and PCB, but since no spatial grid was set up, the data are suggestive only. Furthermore, none of the benthic organisms living on either outfall pipe have been examined for uptake of toxic substances. Very limited sampling near the HTP outfalls suggests that fish living there concentrate chlorinated hydrocarbons to levels higher than those in fish found in non-outfall areas (Figure III-C-40).

- There is considerable evidence that the heavy metals and chlorinated hydrocarbons released from HTP could be directly toxic to organisms encountering them (Tables III-C-2 and 3). As detailed in Chapter III, the concentrations of only a few constituents in the undiluted and diluted effluent are likely to be directly toxic. Most of the direct toxicity would only occur in the immediate vicinity of the outfalls prior to dilution.

  Much more pervasive is the possibility that the constituents being released from the HTP outfalls may cause gradual sublethal effects throughout the food web and result in an altered species composition. These toxicants may be bioaccumulated in individual organisms, be concentrated through the food web, and ultimately end up interfering with reproductive success of marine birds and mammals or end up in human food supplies. As detailed in this report, chlorinated hydrocarbons and heavy metals of the type released from HTP (but not necessarily in the same chemical form) do appear in the tissues of sport and commercial fish as well as in marine mammals and birds, where they are known to have deleterious effects. It has not been possible to trace any such contamination directly to HTP effluent, but since organisms in the Bight do concentrate these substances and since HTP does release them, it can be inferred that some percentage of the uptake is attributable to HTP.

- Wastewater discharges have been postulated to increase the incidence of diseases and abnormalities in marine organisms. Some diseases and abnormalities have been observed in kelp and benthic fauna. In fish, the incidence of tumors is apparently unrelated to wastewater outfalls while fin erosion disease is. The cause of these diseases and abnormalities, however, is not known.

(c) Ballona Creek. The overflows of the NOS (see Hydrology section) to Ballona Creek may adversely impact the biota in the creek and the nearshore waters where the creek enters Santa Monica Bay. The biological communities present have not been described, but they are probably much reduced since the creek is lined with concrete rubble above Sawtelle

Blvd. Potential impacts to the organisms present in the near-shore waters of the bay are expected to occur mainly from the effects of toxic sewage constituents. These effects are expected to be minimal for the creek since such overflows are infrequent, are of short duration, and occur during high flow periods. For Santa Monica Bay, however, the impacts may be considerably greater since near-shore organisms may bioaccumulate the toxicants and/or pathogens to levels that could be damaging to themselves or to their predators (including man). The magnitude of the impact cannot be determined at this time as a result of insufficient data on the effluent quality, the dilution by existing creek flows, and a lack of description of the biological communities that may be affected.

d. Impacts on Socioeconomic Elements of the Environment.

(1) LAND USE AND AESTHETICS. The only direct impact of the No Project Alternative on land uses would be the utilization of a small portion of the Hyperion site for additional treatment facilities. Secondary impacts on land uses in the service area resulting from limitations on sewer hook-ups or other constraints imposed to alleviate potential problems are discussed in Chapter IX. Adverse aesthetic impacts due to sewer overflows during wet weather would continue or increase.

(2) POPULATION. No primary impacts on population distribution would result from selection of the No Project Alternative. Changes in local growth patterns resulting from limitations on sewer service are considered secondary impacts and are discussed in Chapter IX.

Employment opportunities as a direct result of the No Project Alternative would not differ significantly from existing conditions. Modernization and increases in secondary capacity of the Hyperion Treatment Plant would result in about 10 more employees than the present number of 250. Operation of the L.A.-Glendale Water Reclamation Plant requires 29 employees. This figure would not change under the No Project Alternative.

(3) ECONOMY. The cost of running the existing L.A.-Glendale plant would not change and is not part of the project. The cost of running Hyperion Treatment Plant would be reduced slightly because of modernizations but would be increased by the doubling of secondary capacity. Improvements to the plant would reduce future needs for repairs. Operation and maintenance costs for Hyperion would be $235,390,000 (in 1975 dollars) for the 24-year period. Costs incurred by work crews due to the need for repairs on existing sewer systems and clean-up work following heavy storms would continue or increase if problems are aggrevated by overloading of existing undersized or weakened sewer lines.

Serious secondary economic impacts would result from bans on sewer hook-ups, amplified requirements for industrial pretreatment, and other measures taken to reduce increases in the use of the existing sewage treatment system. These secondary impacts are discussed in Chapter IX.

(4) COMMUNITY SERVICES. There will be no direct impacts of the No Project Alternative on community services. Community services will be indirectly impacted by shifts in population and changes in the economy resulting from the necessary restrictions on sewer hook-ups. These factors are discussed in Chapter IX.

(5) UTILITIES. Sewer service is the only utility that will be directly impacted by selection of the No Project Alternative. No public sewage treatment facilities are provided in the San Fernando Valley, so major sewer lines must carry waste downstream to the Hyperion Treatment Plant. Portions of both the North Outfall Sewer and the Valley Outfall Relief Sewer below the Sepulveda Flood Control Basin are reaching or exceeding their design flow capacity. Proposals to alleviate this problem include either provision of the Additional Valley Outfall Relief Sewer or a treatment plant (i.e., Sepulveda Water Reclamation Plant) upstream from the area suffering from hydraulic problems. Treated water from this plant would then be discharged to the Los Angeles River or used locally.

The No Project Alternative would provide no relief of hydraulic problems in the San Fernando Valley. In order to avoid overflows of sewage into the city streets and the Los Angeles River, it would be necessary to place constraints on the volumes of waste entering the sewage system. These constraints could take several forms. First, water rationing could be used to reduce the volume of sewage entering the system. Second, industrial and commercial facilities could be required to provide their own treatment and recycle water, thereby significantly reducing their contribution of waste volume to the sewer system. Third, bans could be placed on new sewer hook-ups.

Temporary hydraulic relief could be achieved through water rationing since existing problems are the result of excessive volumes rather than excessive solids concentrations of sewage. Extensive efforts would be required to establish water allotments and to monitor and restrict water use. Recent water shortages in California may provide the incentive, or in fact the necessity, for reducing water use. In order for water rationing to effectively reduce volumes of waste entering the sewer system, household uses of water would need to be reduced. Limitations on irrigation of lawns, gardens, and other water uses where water does not enter the sewer system would not help to solve the hydraulic problem. It would be difficult or impossible for a water rationing program to control the types of water use so long as the imposed limit on use for each household was observed.

Requirements for commercial and industrial facilities to recycle water using their own treatment systems could possibly be implemented for existing businesses. However, if such limitations were feasible the impact would be small since only a small percentage of wastewater generated in the San Fernando Valley originates in commercial or industrial facilities. Extensive waste treatment requirements imposed on new businesses and industry wishing to enter the San Fernando Valley probably would have the effect of restricting this type of growth in the same manner as if a total ban were placed on hook-ups to the sewer system.

Sewer hook-up bans would result in serious growth restrictions and would limit the types of growth to development of single family housing on large lots which could be served by septic tanks. No multi-family housing, commercial, industrial or public facilities would be added in the area with this type of restriction on development. Secondary impacts resulting from these limitations are discussed in Chapter IX and include potential pollution of groundwater due to the use of septic tanks, possible degration in air quality resulting from provision of housing without the possibility for providing employment opportunity and public services in the same area, and significant changes in the expected land use patterns as a result of growth limitation.

Another serious hydraulic problem in the existing system occurs when the NOS overflows into Ballona Creek during wet weather. This problem is due primarily to infiltration and inflow in the NOS above Ballona Creek, and limitations in the capacity of NOS where it enters HTP. Limitations on sewer hook-ups in the service area would have extremely limited value in solving the hydraulic problems at Ballona Creek. In an effort to improve treatment plant effluents without providing full secondary treatment, source controls could be intensified for industries. The secondary impacts of this possibility are discussed in Chapter IX.

(6) ENERGY USE AND CONSERVATION. Some energy conservation will result from modernization of the Hyperion Treatment Plant. The use of energy at other facilities will be the same as at present. Present conditions are described in Chapter IV. Indirect impacts of the No Project Alternative on energy use and conservation are described in Chapter IX.

(7) TRANSPORTATION. The slight increase in the number of workers at the Hyperion Treatment Plant from 250 to 260 as a result of changes to the facilities will result in similar changes in the number of vehicles traveling to and from the plant. This impact is expected to be unnoticeable.

There is a potential for primary project impacts on traffic if sewers become sufficiently overloaded that overflows occur into city streets. Such problems could be expected in the San Fernando Valley area if hydraulic relief is not achieved.

(8) AREAS OF SPECIAL SIGNIFICANCE. Implementation of the No Project Alternative will have no direct adverse impacts on archaeological,

historical or paleontological resources. There is a possibility of No Project Alternative impacts on significant areas of the marine environment resulting from continued sludge disposal to the ocean and failure to provide full secondary treatment.

2. INLAND COASTAL SPLIT OF TREATMENT CAPACITY (B4C)

a. Project Summary. Major elements of this alternative include provision of 307 mgd secondary treatment at Hyperion and an initial 40 mgd tertiary treatment at Sepulveda followed by 30 mgd and 15 mgd additions to Sepulveda and a 10 mgd addition to the existing 20 mgd LA-Glendale Water Reclamation Plant. Sludge removal and disposal for all three treatment facilities would be provided at Hyperion. In addition to the tree major treatment facilities recommended under this alternative the East Valley Interceptor Sewer would be constructed in two units to increase the service area tributary to the Sepulveda Water Reclamation Plant. Reclaimed water made available by the Sepulveda and LA-Glendale Plants would be distributed for irrigation purposes through two proposed systems. The first would be the Griffith Park Reclaimed Water Delivery System designed to provide a maximum of 9 mgd for irrigation of Griffith Park. The second would be the Sepulveda Dam Recreation Area Reclaimed Water Delivery System designed to provide a maximum of 9 mgd from the Sepulveda Facility for irrigation of existing and proposed golf courses in the recreation area.

The dates when elements of this alternative become operational (see Table VII-1) were determined so that additional treatment capacity would be provided commensurate with projected increases in population in different portions of the service area. Major population increases are projected for the San Fernando Valley. The Sepulveda Plant is designed to treat San Fernando Valley wastewater and provide reclaimed water for irrigation, groundwater recharge, or industrial uses as needs become established, and if uses are approved by the State Department of Health.

Normal, wet weather and emergency operations are described in the Facilities Plan. Backup systems including extra pumps, generators, and alternative power and water supply systems are designed to operate during any reasonable sort of emergency situations. Storage facilities for chlorine and other essential supplies are sufficient to last several days. Should secondary treatment systems fail, full primary treatment could still be provided at any of the plants. In addition, bypass systems have been designed for the Sepulveda and the LA-Glendale plants.

New employment opportunities would be provided under Alternative B4C at Hyperion, Sepulveda, and the LA-Glendale plants. Operations at Hyperion including sludge removal and disposal would require 68 additional employees. Sixty-seven employees would be required for the final 86 mgd

Sepulveda Plant and 12 employees would be required to operate the additional 10 mgd unit at the Los Angeles-Glendale Water Reclamation Plant. Total projected operation and maintenance costs for Alternative B4C are $452,561,000 (1975 dollars) for the life of the project. The breakdown in operation and maintenance (O&M) costs for each major project element is shown in Table VIII-17. State and Federal funds do not support operation and maintenance costs for treatment facilities. The city plans to finance these operations by user charges.

Table VIII-17. Summary of primary economic impacts of operation for elements of Alternative B4C.

ELEMENT	YEARS COVERED BY O&M	TOTAL O&M COST (1975 $)	O&M PRESENT WORTH	TOTAL O&M DIRECT MY LABOR	TOTAL O&M PAYROLL
HTP Secondary & Modern 307	1976-2000	$371,582,000	$158,604,000	7767	$116,505,000
Sepulveda 40 mgd	1979-2000	44,968,000	18,456,000	990	14,850,000
Sepulveda 30 mgd added	1981-2000	22,580,000	8,528,000	320	4,800,000
Sepulveda 15 mgd added	1994-2000	3,948,000	899,000	56	840,000
EVIS I	1980-2000	588,000	231,000	12.5	188,000
EVIS II	1984-2000	289,000	97,000	6.2	92,000
LAGWRP 10 mgd added	1989-2000	4,956,000	1,361,000	84	1,260,000
Griffith Park Reclaimed Water 9 mgd	1979-2000	2,218,000	910,000	47	710,000
Sepulveda Dam Reclaimed Water 9 mgd	1971-2000	1,432,000	541,000	31	458,000
Total		452,561,000	189,627,000	9313.7	139,703,000

Present Worths may differ from some in Facilities Plan since Facilities Plan at times ascribed discount rate to entire cost of multi-year project at the starting year only. 37 was labor cost factor and 15,000 was average salary.

b. Impacts on Physical Elements of the Environment.

(1) SOILS AND GEOLOGY. Interruptions of sewer or treatment service could be caused by earthquakes of a magnitude great enough to result in structural damage. The potential for earthquake damage is taken into consideration during design of the treatment facilities. In the unlikely event that an earthquake would occur that would seriously damage treatment works or collection systems, bypasses or other emergency systems would be utilized as appropriate. Since the inland-coastal split of treatment capacity would provide three major sites for sewage treatment, it is unlikely that the entire system would be damaged in any given earthquake event. Should the sediments in the Sepulveda Flood Control Basin be saturated during an earthquake, then there is a potential for liquefaction of the sediments and an increased risk of damage to the proposed Sepulveda facility. As during other types of operational failure, part or possibly all of the waste which would normally enter the Sepulveda or L.A.-Glendale plants could be diverted downstream to Hyperion. Damage to Hyperion would, in the worst case, result in discharge of untreated sewage to Santa Monica Bay. The chances of such an accident are remote; therefore, potential impacts are not discussed in this report. Seismicity of treatment plant sites is discussed in Chapter II.

Implementation of the Interim Sludge Disposal Project would require significant additional use of the landfilled sites. These and other impacts of sludge disposal are being addressed in Addendum #3. No other primary impacts on soils or topography are anticipated as a result of implementation of Alternative B4C.

(2) HYDROLOGY. Neither the Hyperion Treatment Plant nor the LA-Glendale Water Reclamation Plant would be endangered by a flood up to the 250-year level. Moreover, damage to HTP from a tsunami is extremely unlikely because of the gradually sloping ocean bottom along the Southern California Coast. The Sepulveda Water Reclamation Facility would be waterproofed against a 100-year flood. Water would cover approximately 1/3 of the plant grounds at the 100-year flood leve, but the plant will be designed to provide full secondary treatment under these conditions. For all flows up to the 100-year flood level, flash chlorination would be provided instead of using the chlorine contact basins, which would be inundated by the flood waters. For greater floods, wastewater would be diverted around the Sepulveda plant except when the NOS-LCSFVRS interceptor sewer reaches capacity.

During the operational phase of alternative B4C, water consumption at treatment facilities would be increased over the present condition. Hyperion potable water use would be increased slightly as a result of an increase in the number of shower and restroom facilities. Some potable water use would also occur at the Sepulveda plant and at LA-GWRP as a result of the 10 mgd addition to the plant.

Flow in the Los Angeles River (Figures VIII-5, VIII-6, and VIII-7) will be augmented as a result of effluent discharged from SWRP and LA-GWRP. The maximum additions to the river for SWRP would be 38 mgd prior to 1980, 66.5 mgd between 1980 and 1993, and 80.5 mgd after 1993. This represents approximately 30 percent of the winter flow and 380 percent of the summer flow at Tujunga Blvd. (Figure VIII-7) prior to 1980, 50 percent of the winter flow and 670 percent of the summer flow between 1980 and 1993, and 60 percent of the winter flow and 800 percent of the summer flow after 1993. The proposed use of up to 9 mgd of this effluent for irrigation in the Sepulveda Recreation Area would reduce the amount of effluent discharged to the river after 1980. Additional uses of the reclaimed water from this facility would further reduce the discharges to the river. The maximum discharge of reclaimed water from LA-GWRP to the river will be 18.5 mgd until 1980 and 28 mgd after that date. Proposed uses of this reclaimed water, however, should take all of the initial 18.5 mgd. The maximum increase in flow in the lined channel at Firestone Blvd. (Figure VIII-5) would be 108.5 mgd if all water from these plants were discharged to the river (and no evaporation or percolation through the river bed occurred).

None of the discharges to the river from SWRP are expected to cause the total flow to exceed the capacity of the low-flow section of the unlined channel. The low-flow section of the lined channel decreases in volume from the Los Angeles Narrows to the mouth of the river, and the maximum potential discharge from LA-GWRP and SWRP combined would exceed

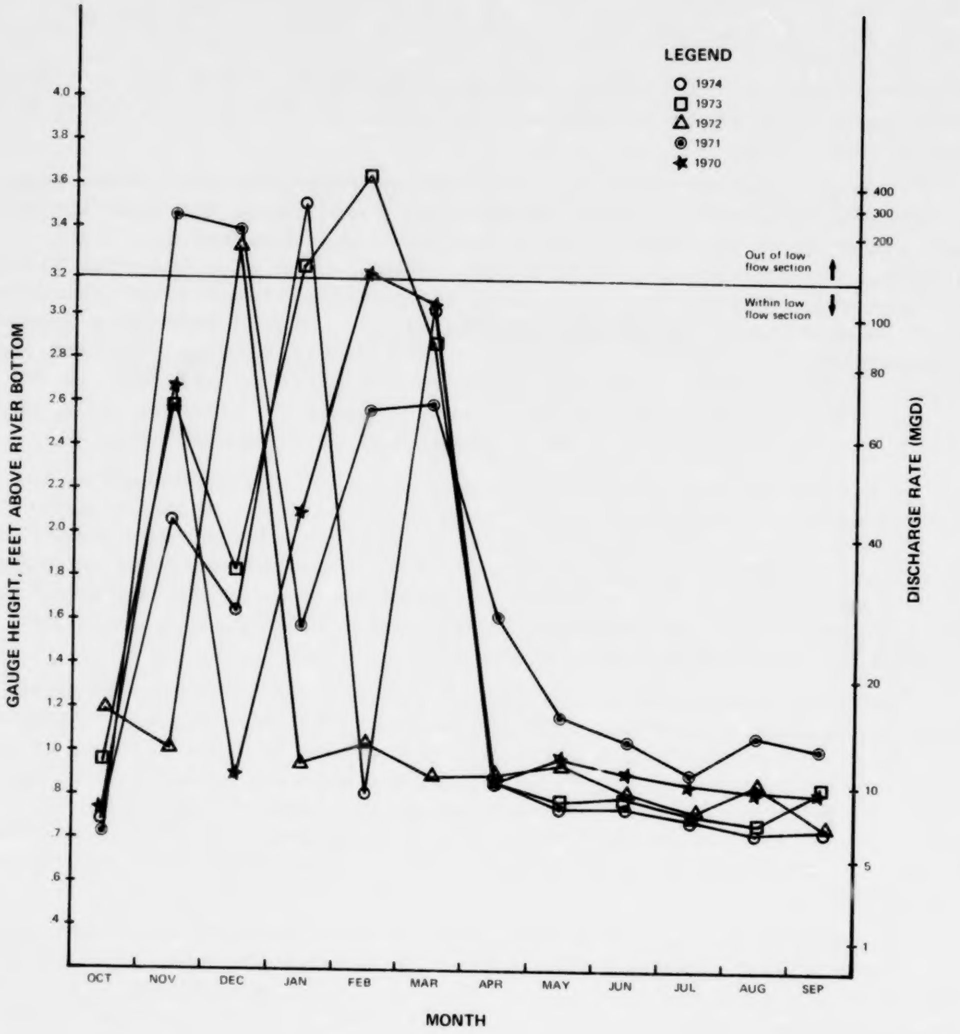


Figure VIII-7. Average recorded monthly gauge height in the Los Angeles River at Tujunga Avenue (Station No. F 300-R) for the years 1970 through 1974 (data from Los Angeles County Flood Control District annual reports).

the capacity of this section below Firestone Blvd. (Figures VIII-5 and VIII-6) during dry weather.

The quality of effluent from SWRP and LA-GWRP is predicted to be the same (see Table VIII-13), and the quality is generally better than that in the river. The impacts on quality of existing river waters and groundwater are expected to be the same as those described in the No Project Hydrology section. The potential for percolation into the groundwater, however, is expected to be somewhat greater for Alternative B4C since more permeable river bottom is exposed to the effluent, particularly at the Headworks

Spreading Grounds. Therefore, increased quantities of metals and chlorinated hydrocarbons may enter the groundwater which is used as a drinking water source (DWP, 1975).

In most cases of plant failure, sewage from upstream plants would be diverted to existing sewer systems and would reach the Hyperion Treatment Plant where at least primary treatment and chlorination could be provided. Under extraordinary circumstances, such as a 100-year flood at the Sepulveda Facility, secondary effluent receiving flash chlorination would be discharged to the Los Angeles River. Should secondary treatment at Sepulveda fail, primary treatment would continue to be provided and chlorination would be increased prior to discharge of effluent to the river. This emergency system would operate only if bypasses were not possible due to concurrent peak flows in the major bypass sewers.

The effluent not reclaimed, percolated into the groundwater, or evaporated ultimately flows into Los Angeles Harbor. This increased input into the Harbor should not measurably affect the quality of harbor waters, although the higher mass emissions of substances will increase the background levels in the harbor. The "estuarine zone" in the mouth of the L.A. River will be augmented by increased freshwater inputs, but the increase in size has not been predicted.

Effluent discharges to the marine environment will also be different from the present situation. All effluent discharged from the 5-mile outfall will receive secondary treatment, and the volume will be reduced to 307 mgd. Discharge of sludge from the 7-mile outfall will be terminated in April 1980, and no centrate will be released to the ocean. Improving the effluent quality (Table VIII-14) along with decreasing the volume will reduce the mass emissions of sewage constituents (Table VIII-18) to Santa Monica Bay.

The reductions in concentration (see Table VIII-14) and mass emissions (see Table VIII-18, Alternative B4C) of most effluent constituents will significantly decrease deposition of sediments of wastewater origin near the 5-mile and 7-mile outfalls, and will curtail contributions of HTP effluent to degraded water quality in Santa Monica Bay. Although the only constituents of HTP effluent that have been monitored to show distribution of the HTP effluent plume are turbidity (a result of suspended solids) and coliform bacteria, it is assumed that all constituents are similarly distributed. It is anticipated that both areal distribution and concentration of suspended solids, coliform bacteria and other wastewater constituents of HTP origin will be decreased. The cessation of the sludge discharge and the provision of full secondary treatment will greatly reduce the potential for bioaccumulation and biomagnification through the food web. Based upon the foregoing, it is anticipated that the improved effluent quality will significantly improve water and sediment quality of Santa Monica Bay. Even with secondary treatment, the effluent may not meet the Ocean Plan 50 percent standards for cyanide, chromium, mercury, and nickel (assuming normal distribution about the mean). Mercury probably could be adequately controlled at the sources (mainly hospitals) if new regulations were promulgated and enforced. No known methods of control would bring chromium discharges within existing standards.

Table VIII-18. Mass emission rates for constituents in the HTP 5- and 7-mile effluents in 1975 and those predicted for the 5-mile effluent for each of the alternatives for the year 2000.

CONSTITUENT VOLUME (MGD)	MASS EMISSION RATES (METRIC T/YR)				
	PRESENT 5-MILE	PRESENT 7-MILE	5-MILE ONLY NO PROJECT[1]	B4C[2]	C3[3]
COD	117,816[4]	50,015[4]	113,400	29,699	38,309
BOD	59,599	12,341[4]	54,698	6,364	8,209
TSS	40,527	47,416[4]	37,361	10,607	13,682
TDS	409,998[4]	5,547[4]	527,865	383,544	494,734
TS	449,113[4]	61,209	565,243	394,151	508,416
Oil and Grease	9,536	5,764	8,754	270	383
Phenols	19	1.7	23	8.5	11.0
Detergents (MBAS)	1,860	ND	2,626	359	695
Organic Nitrogen	4,053	2,044	3,931	2,444	3,152
Nitrite Nitrogen	33	ND	8.6	12.7	16.4
Nitrate Nitrogen	76	ND	97	59	77
Ammonia Nitrogen	6,627	1,949[4]	9,383	7,213	9,304
Phosphate Phosphorus	4,291	475	10,298	1,438	1,860
Cyanide	67	4.0	114	47	60
Aluminum	259[4]	ND	326	195	252
Copper	91	99.8	97	47	60
Zinc	110	137	166	98	126
Iron	302[4]	511[4]	349	225	290
Nickel	72	18.1	97	59	77
Lead	14	12.2	23	12.7	16.4
Arsenic	4.8	1.7	5.7	4.2	5.5
Cadmium	9.5	7.0	14	8.5	11.0
Chromium (+6)	0.0[4]	ND	0.0	0.0	0.0
Chromium (+3)	62	69.5	120	59	77
Manganese	9.4[4]	1.2[4]	14	12.7	16.4
Selenium	9.5	1.6	17	8.1	10.4
Mercury	0.95	0.6	1.9	1.0	1.3
Silver	9.5	4.8	14	8.1	10.4
Total Identifiable Chlorinated Hydrocarbons	2.9	0.16	1.03	0.9	1.1

[1] No Project based on maximum predicted effluent volume by SCAG for the year 2000 and 200 mgd secondary treatment.

[2] E2 is the same as B4C except that in 1985 the volume would decline to 232 mgd thus reducing emissions by 24 percent.

[3] CX is 25 percent less with a volume of 386 mgd.

[4] Based on 1974 effluent quality.

Qualification Note 1: Further analysis of expected removal efficiencies of Alternatives B4C and C3 is necessary to ascertain the mass emission rates. Normally, the higher influent concentrations (in B4C) would be expected to have lower removal efficiencies and, therefore, perhaps higher mass emission rates.

Qualification Note 2: The decreased mass emissions given for B4C with respect to C3 represent constituents discharged with the effluent to the Los Angeles River, with the exception of constituents entering the groundwater through percolation. The effluent remaining in the Los Angeles River will enter the marine environment at the mouth of the Los Angeles River.

The cessation of sewage sludge discharge to the ocean from Hyperion Treatment Plant will have several effects on the physical and chemical environment, particularly in the immediate vicinity of the present discharge. Sludge from primary and secondary treatment is currently discharged at a depth of 98 m (320 feet), and the past impacts are discussed in Chapter III and summarized in the impact discussion of the No Project Alternative.

Cessation of sludge discharge will immediately stop the accumulation of sludge related organic and toxic substances in the sediments. It is not known whether the substances already in the sediments will ever be mobilized and dissolved in the water, but strong evidence against rapid mobilization is presented in Chapter III. The reduced (anaerobic) character of some of the sediments resulting from the high organic content of the sludge is apparently responsible for the lack of mobilization. Volatile solids (organics) appear to be mobilized more rapidly than other toxicants, and it is possible that once organic discharge is halted, toxicants will be released from the sediments, and the sediments will return to a nearly pre-discharge chemical condition. The rate at which such a change may take place is not known for deposits in water as deep as this, but at the JWPCP (Whites Point) outfall, substantial reductions occurred in a few years. If mobilization does take place, the mobilized toxicants will no longer influence benthic infauna but may become available to organisms living in the water column, and thus, may transiently increase the levels of toxicants at all levels of the food web. Alternatively, it has been suggested that the accumulated sludge may quickly be covered by natural sediments (Mearns et al., unpublished).

The impacts of terminating sludge discharge on the concentrations of dissolved toxic substances in the water column cannot be accurately predicted because neither the concentrations of these substances in the water column nor the amount released into the water column from sludge particulates is known. The estimated reduction in mass emissions of sewage constituents (sludge and wastewater) to Santa Monica Bay expected from implementing Alternative B4C are shown in Table VIII-19. The reductions are variable, ranging from approximately 1 percent for silicate to 98 percent for oil and grease. The emissions of heavy metals would be decreased 27 to 75 percent and chlorinated hydrocarbons by 71 percent. Total nitrogen would be decreased by more than 34 percent (calculated from Table VIII-18).

(3) AIR RESOURCES. Air resources will be adversely impacted by additions to levels of vehicular emissions. At Hyperion, approximately 40 truck trips per day will be required to dispose of sewage sludge in landfills. Another 9 to 13 trips per day will be required for disposal of grit screened out in the primary phase of treatment. An average of roughly 2 to 3 additional truck trips per day will be required for delivery of supplies such as chlorine, liquid oxygen, and diesel fuel. Also, 68 additional employees will be required for operating the Hyperion Treatment Plant and these workers will be commuting to and from the site. Since solids will not be removed at the Sepulveda or the L.A.-Glendale Treatment Facilities, truck traffic to and from those facilities will

Table VIII-19. Estimated percentage reduction in the mass emissions of sewage constituents to Santa Monica Bay for Alternatives B4C and C3. Calculations are based on data in Table VIII-18.

CONSTITUENT	B4C[1]	C3[2]
COD	82	77
BOD	91	89
TSS	88	84
TDS	8	-19[3]
TS	23	0.4
Oil and Grease	98	98
Phenols	59	55
Detergents (MBAS)	>81	>63
Organic Nitrogen	60	48
Nitrite Nitrogen	>62	>50
Nitrate Nitrogen	>22	<-1[3]
Ammonia Nitrogen	16	-9[3]
Phosphate Phosphorus	70	61
Cyanide	34	16
Aluminum	>25	> 3
Copper	75	69
Zinc	60	49
Iron	72	64
Nickel	35	15
Lead	52	37
Arsenic	35	15
Cadmium	49	33
Chromium (total)	>55	>41
Manganese	-20[3]	-55[3]
Selenium	27	6
Mercury	36	16
Silver	43	27
Total Identifiable Chlorinated Hydrocarbons	71	64

[1] Alternative E2 is the same until 1985 when these percentages will be increased as a result of decreased mass emissions from HTP.

[2] Alternative CX is similar with slightly higher percentages.

[3] Negative number indicates an increase.

Qualification Note 1: Further analysis of expected removal efficiencies of Alternatives B4C and C3 is necessary to ascertain the mass emission rates. Normally, the higher influent concentrations (in B4C) would be expected to have lower removal efficiencies and, therefore, perhaps higher mass emission rates.

Qualification Note 2: The decreased mass emissions given for B4C with respect to C3 represent constituents discharged with the effluent to the Los Angeles River, with the exception of constituents entering the groundwater through percolation. The effluent remaining in the Los Angeles River will enter the marine environment at the mouth of the Los Angeles River.

be limited to the needs for grit disposal from the primary phase of treatment and the delivery of supplies. During the 40 mgd operational phase of Sepulveda approximately 45 employees will be required. This will be increased by 14 when the 30 mgd unit is added and by 8 when 15 mgd unit is added for a total in the year 1994 of 67 employees. The 10 mgd addition to the L.A.-Glendale facility will require 12 employees in addition to the 29 needed for the 20 mgd plant.

Odors presently generated by the Hyperion Treatment Plant will be substantially reduced following modernization and other improvements of the plant. Odors during normal operation of other treatment facilities should not be noticeable.

Air quality will be indirectly affected by emissions caused during the generation of power consumed at the plant and required to produce oxygen or ozone, chorine, or other supplies utilized during treatment.

(4) NOISE. "Hyperion will be designed to comply with applicable noise regulations of both the City of El Segundo and the City of Los Angeles.

"The most stringent El Segundo noise limitation is 50 dB(A) between the hours of 10 PM and 7 AM. The City of Los Angeles has established a 70 dB(A) noise limitation for areas with M3 land zoning (e.g., Hyperion). The El Segundo noise limitation will be the governing standard used for design of Hyperion facilities.

"Localized noise sources may be in excess of 50 dB(A) (e.g., cryogenic plant, surface aerator units, power generating equipment), despite noise reduction measures such as the housing of noisy pieces of equipment, the use of air piping insulation, and the possible use of sound barriers. The east Hyperion hillside and the distance between noise sources and El Segundo residential areas will be utilized in predicting the noise actually reaching the residences.

"Ambient nighttime noise levels without treatment plant operation are probably in the 45-50 dB(A) range. Existing ambient noise levels at the El Segundo residences to include plant operations are in the 53 to 67 dB(A) range (Readings from Station 62 of Hyperion noise survey).

"Prediction of noise levels from the completed Hyperion plant is extremely difficult as design data is not complete as to the facilities to be utilized (e.g., number and size of turbine generators is not known).

"The noise from Hyperion in addition to ambient noise will result in an estimated 50-60 dB(A) noise level. Aircraft operations will intermittently raise noise levels above the 50-60 dB(A) level" (LAC, DPW, 1976).

c. Impacts on Biological Elements of the Environment.

(1) TERRESTRIAL ECOSYSTEMS. Primary impacts of the project on terrestrial ecosystems would result from the need for landfill space for

disposal of sludge, from the availability of reclaimed water for irrigation purposes, and from uses of space where treatment facilities were constructed in formerly vegetated areas. The impacts of landfill requirements are treated in a separate report describing the environmental effects of the Interim Sludge Disposal Program.

Reclaimed water will be used for irrigation of golf courses and parks. If reclaimed water were not available, the same facilities might be maintained by using water from other sources - probably at greater expense. Watered areas will be primarily for human use through culture of lawns and ornamental plantings. However, these habitats will be used by some species of birds, small mammals, reptiles, and amphibians. No significant biological resources will be supported or otherwise affected by the use of reclaimed water for irrigation.

The loss of existing terrestrial biological habitat for use as treatment facility sites was described in the discussion of impacts of construction. The impacts during the operational phase will simply be a continuation of the use of this land for treatment facilities for the duration of the project.

(2) AQUATIC ECOSYSTEMS. Both fresh water and marine ecosystems will be affected by implementation of Alternative B4C. Discharges of water to the Los Angeles River, as discussed in the Hydrology section, will provide permanent flow which can augment the available aquatic habitat, particularly along the unlined portions of the river. Discharges of reclaimed water to the Los Angeles River from SWRP and LAGWRP will increase the flow in a portion of the river that is not completely concrete lined and, thus, would create a fairly "natural" riverine aquatic habitat that could potentially support a variety of organisms. The increased flow may eliminate some of the more terrestrial vegetation now in the stream bed, but aquatic species could replace them. The occurrance of nuisance species, such as gnats, mosquitoes, and odor producing algae, should not be increased by the augmented flow and may even be reduced from the present conditions. Since the natural high flows during wet weather may flush many of the organisms downriver, the species inhabiting the river above the Los Angeles Narrows after SWRP and LAGWRP begin discharging will be those that are tolerant of variable flows or those that can recolonize rapidly. Below the Los Angeles Narrows, the river is concrete lined and the increased flows would have a minimal effect until the volume exceeds the capacity of the low-flow section (see Hydrology section). When this occurs in the lower stretches of the river, the additional wetted surfaces could support algae and aquatic insects. Production of these organisms at nuisance levels would not be expected except if pooling and stagnation occurred as water levels fluctuated.

The increased influx of freshwater into the tidal prism would enlarge the estuarine zone in proportion to the input, and the potential impacts on the biota are expected to be similar to those discussed in the No Project Alternative but over a larger area.

Water quality of the Los Angeles River will not be degraded as a result of effluent discharges from SWRP or LA-GWRP as discussed in the Hydrology section and thus would not adversely affect organisms in the river. Small amounts of free residual chlorine will occur in SWRP effluents during normal operation but the levels should be too low to have any toxic effects on river biota. Combined residual chlorine present in the SWRP and LA-GWRP effluents in the form of chloramines and other chloroderivatives, however, could potentially affect these organisms. Discharges of lower quality effluent from SWRP during plant failures could deplete the oxygen and increase the solids in the river. In addition, shock chlorination to disinfect the effluent will introduce high levels residual chlorine which could be toxic to some species of river biota, such as fish, benthos, and plankton. Emergent vegetation is not expected to be adversely affected by this discharge.

If the Griffith Park irrigation scheme is implemented as proposed, there will be no discharge of reclaimed water to the Los Angeles River. Hydraulic relief provided in the Ballona Creek area will prevent future overflows from the sewer system into the creek and thus alleviate the impacts that such discharges have had in the past (see No Project description).

The discharge of 307 mgd of secondary treated effluent from the Hyperion Treatment Plant through the 5-mile outfall and discontinuation of sludge disposal to the ocean through the 7-mile outfall will result in several changes in the marine environment. Impacts that will occur as a result of conversion to full secondary treatment can be attributable to three categories of changes. First, there will be decreases in the amounts and concentrations of toxic compounds released, almost certain to be viewed as a beneficial change. Second, there will be decreases in the amounts of total suspended and dissolved solids released, which will probably alter the turbidity and light penetration near the outfall, as well as concentrations of toxic substances associated with the particles, a beneficial change. And third, there will be a substantial (70 percent) decrease in the phosphate additions as well as a moderate (34 percent) decrease in the total nitrogen additions. The decrease in release of these nutrients is of little concern because the long-term releases of them from HTP probably have no significant role in supporting the existing fishery in Santa Monica Bay.

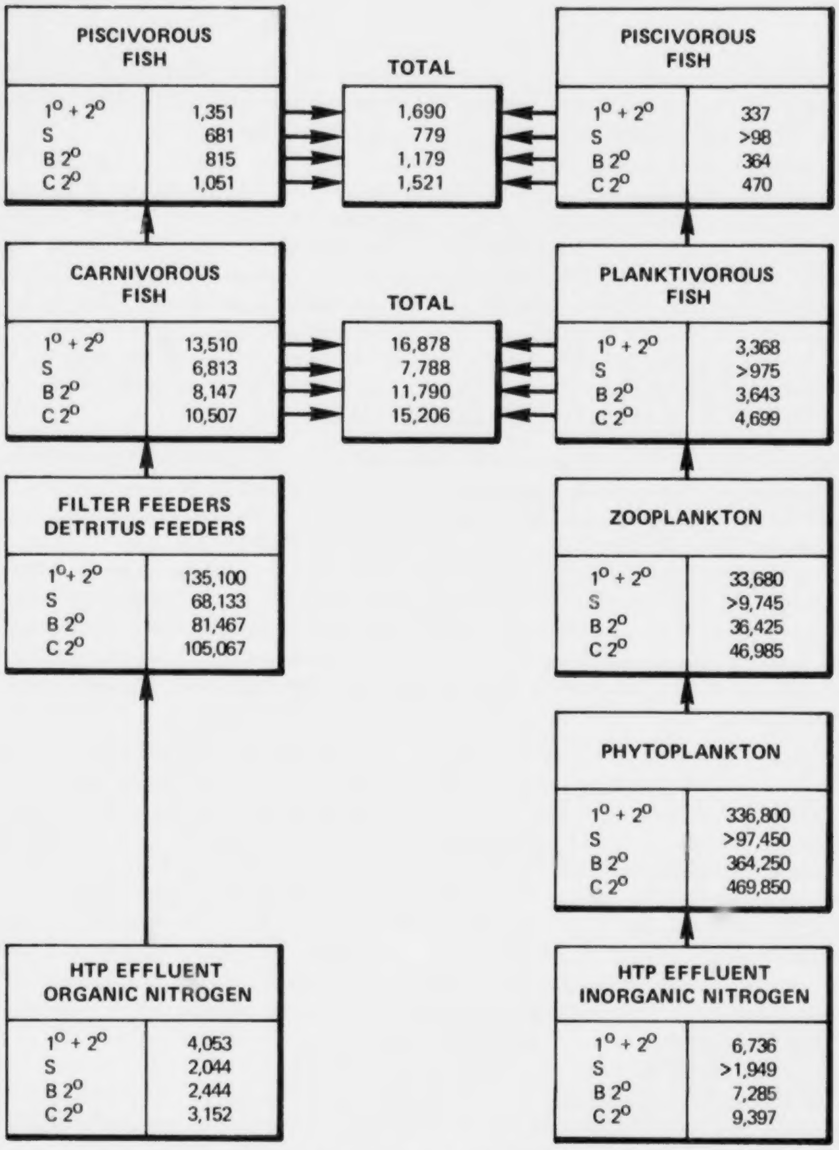
(a) General Impacts of Nutrient Alterations. The overall levels of nutrients will be decreased as a result of conversion to full secondary treatment with a 34 percent decrease in total nitrogen releases (including cessation of ocean sludge disposal). The concentration and mass emissions of nitrite and nitrate nitrogen as well as organic nitrogen in the 5-mile effluent will be decreased while ammonia nitrogen increases (Tables VIII-14 and VIII-18). The various forms of nitrogen are utilized by different species of organisms as discussed in Chapter III, so that a change in the form of nitrogen released may alter the species composition of organisms now utilizing nitrogen from HTP in Santa Monica Bay. Phytoplankton generally utilize nitrate nitrogen most efficiently, and a decrease in the nitrogen immediately available to phytoplankton may decrease their productivity in the immediate vicinity of the outfalls.

The magnitude of such a localized decrease will depend upon the amount of nitrate that reaches the euphotic zone where phytoplankton live. Evidence from the distribution of coliform bacteria (see Chapter III) indicates that the plume from the 5-mile outfall seldom reaches the surface in the summer when warm water and high light intensity would favor high phytoplankton productivity, and it only reaches the surface in the winter in very diluted form. Toxicants in the effluent also appear to decrease the productivity potential expected for the nutrient levels present. There is insufficient information about the dilution and distribution of the plume to make a good estimate of the resulting nitrate levels in the euphotic zone, but the long-term effects on phytoplankton productivity near the outfall, and ultimately the local fishery in Santa Monica Bay, would probably be insignificant.

The concomitant decrease (60 percent) in organic nitrogen being released may decrease the productivity of the benthic and nektonic invertebrates and zooplankton that are thought to be consuming the organic particulates (see Figure VIII-8). Indirect beneficiaries of the organic nitrogen are the carnivorous fish that feed on the benthic invertebrates in the vicinity of the outfall. Thus, if the benthos decrease, then so may the populations of rockfish and flatfish near the outfalls. Some of these, particularly the rockfish, are caught for recreation, and the reduction could decrease the value of the bottom recreational fishery in Santa Monica Bay.

It must be noted, however, that all of these scenarios are decidedly speculative. The predominant food chains in the Bay have not been well established, and most of the data that have been collected on plankton and benthos distributions have not yet been analyzed. It is probable, given the available information from coliform bacteria distribution used to delineate the distribution of the effluent plume from the 5-mile outfall, that much of the nutrients released from the outfall is distributed widely in the Southern California Bight and into the Pacific Ocean. To analyze the overall effects of nutrient level changes resulting from conversion to full secondary treatment, a broader analysis, assuming that all nutrients eventually find their way into the human food chain, is required. Figure VIII-8 shows an estimate of the potential fish production that could result from conversion to full secondary treatment as compared to that from the present 5-mile and 7-mile discharges. A potential decrease in top carnivore fish of 1,290 metric tons (1.4 percent of the 1972 catch brought into Los Angeles Harbor), or of 12,876 metric tons (13.9 percent of the 1972 catch brought into the Los Angeles Harbor) of lower trophic level fish could occur. Of the non-tuna fish considered in this analysis, approximately 55 percent brought into Los Angeles Harbor are top carnivores and 45 percent are lower trophic level carnivores and planktivores. Thus, the potential decrease in the commercial fishery resulting from conversion to full secondary treatment would be mainly in the lower trophic level species of the catch.

The assumptions on which this analysis is based are discussed in Chapter III and should be consulted. The values arrived at here should


PISCIVOROUS FISH
1° + 2° 1,351
S 681
B 2° 815
C 2° 1,051
TOTAL
1,690
779
1,179
1,521
PISCIVOROUS FISH
1° + 2° 337
S >98
B 2° 364
C 2° 470
CARNIVOROUS FISH
1° + 2° 13,510
S 6,813
B 2° 8,147
C 2° 10,507
TOTAL
16,878
7,788
11,790
15,206
PLANKTIVOROUS FISH
1° + 2° 3,368
S >975
B 2° 3,643
C 2° 4,699
FILTER FEEDERS DETRITUS FEEDERS
1° + 2° 135,100
S 68,133
B 2° 81,467
C 2° 105,067
ZOOPLANKTON
1° + 2° 33,680
S >9,745
B 2° 36,425
C 2° 46,985
PHYTOPLANKTON
1° + 2° 336,800
S >97,450
B 2° 364,250
C 2° 469,850
HTP EFFLUENT ORGANIC NITROGEN
1° + 2° 4,053
S 2,044
B 2° 2,444
C 2° 3,152
HTP EFFLUENT INORGANIC NITROGEN
1° + 2° 6,736
S >1,949
B 2° 7,285
C 2° 9,397

NOTE: All numbers are metric tons. $1^{\circ} + 2^{\circ}$ = 1,975 5-mile effluent, S = 7-mile effluent, B 2° = full secondary for Alternative B4C, and C 2° = full secondary for Alternative C3. Detritus and filter feeders are assumed to be 3 percent nitrogen and phytoplankton 2 percent nitrogen. A more detailed discussion of the assumptions are presented in Chapter III.

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Figure VIII-8. Comparison of standing crop biomass pyramids that could hypothetically result from nitrogen in the Hyperion effluents for 1975 (5-mile and 7-mile effluents) and full secondary treatment in Alternatives B4C and C3.

be considered a "worst case" estimate, and it is very unlikely that decreases to the fishery would be this great, if at all.

(b) Impacts of Toxicant Reductions. The predicted changes in effluent quality following conversion to full secondary treatment are shown in Table VIII-14. Not all of the toxic substances discharged will meet the State standards after full secondary treatment, and those that do meet the standards will be discharged at a lower concentration than with the current treatment. Thus, accumulation of many toxic substances in physical and biological sinks will continue following conversion to secondary treatment, but at a reduced rate.

It is not possible to predict whether an improvement in the quality of the wastewater discharged into Santa Monica Bay would allow kelp to re-establish in areas where it formerly existed because of the complex interaction of variables that influence kelp growth (temperature, turbidity, sedimentation, grazers, etc.). Tables VIII-7 and VIII-8 summarize the potential direct effects on invertebrates and fish. The effects considered are those that occur to organisms exposed to specific concentrations in the surrounding sea water. Because of the rapid dilution of the 5-mile effluent, only organisms in the immediate vicinity of the discharge ports would ever be exposed to the full concentrations in the effluent. Zooplankton and nektonic invertebrates attracted to the outfall by the organic particulates and fish attracted by these organisms might be directly exposed to undiluted effluent. Benthic invertebrates living on the outfall structure may also be affected directly. Tables VIII-7 and Tables VIII-8 (which are based on laboratory results that should be extrapolated to the conditions around the outfall very cautiously) show that the reductions in toxicant concentrations brought about by full secondary treatment will eliminate some of the impacts of DDT, mercury, copper, and silver to invertebrates that may presently exist. It will also decrease the potential impacts of DDT, copper, and silver on fish. The other toxicants are currently below the levels for which direct toxicity has been demonstrated. In addition, provision of full secondary treatment and cessation of sludge disposal in the ocean may eliminate impacts of other wastewater constituents for which data are lacking.

The direct toxic effects, however, are not the most important effects of the release of heavy metals and other toxicants in wastewater. As detailed in Chapter III many marine organisms are capable of concentrating (bioaccumulating) metals and chlorinated hydrocarbons in their tissue from relatively low concentrations in the sea water and in their food. The accumulation of toxic substances in fish tissues, particularly of mercury, lead, and chlorinated hydrocarbons, is of prime interest for public health reasons. Two commercially important species, swordfish and tuna, presently have high mercury levels in their tissues, in some cases exceeding public health standards. Mercury poisoning in humans as a result of eating contaminated seafood has been reported in Minamata, Japan (Kiyoura, 1964). Inorganic mercury was converted to the highly toxic methylmercury in the ocean and was concentrated in fish and other organisms consumed by the people of Minamata with lethal results in several cases.

The concentration of toxic substances in fish for sale are regulated by the FDA to protect the consumer, but not so the fish caught and eaten by the sport fishermen. Thus, people regularly catching and eating fish from the Los Angeles area, particularly along the Palos Verdes peninsula and near the Los Angeles Harbor, may be exposed to a considerable amount of mercury and DDT.

The accumulation of toxic substances in fish is usually the result of a progressive biomagnification throughout the food web, with the lowest level consumers (zooplankton and benthic or nektonic invertebrates) ingesting and concentrating the substances in the first place. There is little evidence concerning the potential accumulation of toxicants by any organisms near the outfalls, since very few organisms have been examined for toxic substances, and much more sampling needs to be done before any conclusions can be reached about localized bioaccumulation. The single experiment conducted by SCCWRP (reported in Chapter III and in less detail in SCCWRP, 1975a) of suspending benthic invertebrates (California mussels) in the water near the outfall and monitoring them for uptake of PCB's and DDT is a step in the right direction and suggests that these substances are bioaccumulated from the effluent plume. Systematic monitoring of benthic organisms on the outfall pipes would also provide information on localized bioaccumulation, and more studies of toxicant accumulation in benthic infauna (in the sediments near the outfall) and in fish caught near the outfall would be valuable. In the absence of any clear evidence about bioaccumulation of toxicants directly traceable to the existing outfall, the only conclusions that can be reached about the impacts of conversion to full secondary treatment are that the reduced toxicant concentration and mass emissions can only result in a less negative impact than currently exists.

The impacts of the past discharges of sludge on the organisms in Santa Monica Bay have been described in Chapter III and summarized in the No Project Alternative. Following cessation of sludge discharge there probably will be a shift in the species composition of the benthic infauna near the 7-mile outfall over time. Indeed, the biota in the vicinity of the 7-mile outfall described in Chapter III, with the exception of that attributable to the physical presence of the pipe and associated structures, is expected to come to a new equilibrium, presumably similar to the pre-discharge condition. The pre-discharge condition was not well documented prior to emplacement of the outfall structure, so that the eventual biological character near the outfall cannot be predicted with certainty. Extrapolation from nearby areas suggests that it will be an *Amphiodia*-dominated community.

The cessation of sludge discharge is expected to have very little effect on nektonic invertebrates. Only those that spend part of the time near the outfall would be affected by the reduction in toxicants discharged.

Fish populations, particularly demersal species, may respond to cessation of sludge discharge in several ways. Fin erosion disease has been directly related to sludge discharge (Chapter III); thus, termination of discharge should result in a reduction in the occurrence of this disease. The time necessary for this to happen, however, is unknown. The distribution of some species may be altered since some appear to be attracted to the outfall while others avoid it. The reef effect of the pipe itself will not be changed unless it is removed or buried with sand, so that in its present exposed condition fish will continue to be attracted to it. Those that are currently attracted to prey upon the organisms associated with the effluent, however, will no longer be attracted.

The sludge presently contains a substantial amount of nutrients (see Table VIII-18), and the mass emissions of nitrogen in the sludge amounted to at least 27 percent of the total nitrogen released from the Hyperion Treatment Plant in 1975. If these nutrients were converted to fish (using the assumptions and analysis presented in Chapter III, the cessation of their input could result in a loss to the fishery of 32 percent of the total presently contributed by Hyperion Treatment Plant (see Figure VIII-8). This production is equivalent to 0.8 percent of 1972 non-tuna commercial catch brought into Los Angeles Harbor for processing for top trophic level fish and 8 percent for lower trophic level fish (tuna are not included because most are not caught in the Southern California Bight). The 1972 commercial catch was made up of approximately 55 percent top carnivore fish and 45 percent lower trophic level fish so that the potential impact on the fishery would mainly be in the lower trophic level fish of the catch. As discussed in Chapter III the assumptions upon which those calculations are based are difficult to substantiate, and the percentages are probably "worst cast" estimates, particularly in view of the fact that an undetermined portion, perhaps nearly all, of the nutrients currently released from the 7-mile outfall are trapped in the sediments. The toxicants released along with the nutrients may also prevent the full potential production from being realized.

Termination of sludge discharge will also decrease the mass emissions of toxicants into Santa Monica Bay. As a consequence, the direct effects of this discharge on organisms in the Bay (e.g., lethal and sublethal toxic effects) will cease. Indirect effects, such as bioaccumulation and biomagnification through the food web, that have resulted from the constituents in this discharge will also desist. The reduction in toxicant input because of the cessation of sludge discharge and provision of full secondary treatment could contribute to increased marine productivity.

d. Impacts on Socioeconomic Elements of the Environment.

(1). LAND USE AND AESTHETICS. Primary project impacts on land use will be limited to continuing use of treatment facility sites for sewage treatment purposes throughout the life of the project. Secondary project impacts on land use will differ from the No Project Alternative by permitting anticipated growth in the service area. These and other secondary impacts are discussed in Chapter IX. Modernization and expansion of the Hyperion Treatment Plant will result in small changes in aesthetic quality of areas surrounding the Hyperion site. Existing problems due to odors released from outdated equipment will be significantly improved during operation of this project. Because of its enlargement, the Hyperion Treatment Plant will be somewhat more visible from residential areas and from streets surrounding the plant. Views of the ocean from nearby residential areas will not be blocked by the new facilities at Hyperion. For some residents, the view will be improved by removal of an existing smoke stack.

The Sepulveda Plant will be visible from adjacent streets, from golf courses and parks in the Sepulveda Dam Recreation Area, and from the Missile Base immediately north of the plant. The presence of the treatment facility will somewhat reduce the feeling of open space in the recreation area as a whole. Because of the existing Missile Base adjacent to the treatment facility, the additional buildings will not cause a major change in the existing view. Landscaping, including development of the Japanese gardens, will be used to buffer the visibility of structures on the treatment facility site.

The 10 mgd addition to the L.A.-Glendale Water Reclamation Plant will be an almost unnoticeable addition to the existing treatment facility structures and surrounding industrial area, even though the plant will be visible from the highway and from the golf course in Griffith Park.

During the operational phase the East Valley Interceptor Sewer will not have any direct impact on either land use or aesthetics.

(2) POPULATION. No significant changes in population distribution are expected as direct effects of operating Alternative B4C. Employee requirements for the operation of treatment facilities are small compared to populations within commuting distance of each plant. Most employees could be drawn from the local area. A few of the more technical jobs might be filled by personnel moving into the project area. Relocations will probably be limited to only a few families at Hyperion and Sepulveda, and even fewer or none at L.A.-Glendale.

(3) EMPLOYMENT. Table VIII-17 shows the employment requirements for operation of the improved Hyperion facility, for Sepulveda and each of the proposed additions to the initial 40 mgd unit, and for the proposed 10 mgd addition to L.A.-Glendale. A total of 9,314 manyears of labor will be provided by operation of all elements of Alternative B4C. Indirect employment opportunities resulting from related jobs within the City and from other jobs created by increased expenditures in the project area are discussed in Chapter IX.

(4) ECONOMY. Primary project impacts on the economy during the operational phase will be limited to wages paid to additional operating personnel and costs born by the community for operating the new facility. The total wages per year for operation of project elements of Alternative B4C will be $139,803,000 (1975 dollars). Total operating and maintenance

costs including dollars paid in wages are estimated to be $452,561,000. This is broken down by major project elements in Table VIII-17.

(5) COMMUNITY SERVICES. Public recreation facilities will be somewhat enhanced by the availability of reclaimed water for irrigation of golf courses and parks. If reclaimed water were not available, the same facilities could be maintained using other sources of water but the cost to taxpayers probably would be greater.

Because the anticipated number of families relocating to the project area represents a very small percent of existing populations, no related impacts on community services are expected. No other direct project impacts on community services are anticipated as a result of the operation of alternative B4C.

(6) UTILITIES. There will be no direct operational phase impacts of this project on utilities other than sewage treatment. The operation of treatment facilities will require nominal amounts of potable water, power, and communications. These needs can be supplied from existing systems with no impact on other utility users. Some of the treatment facilities will produce power on-site using gases generated during the sewage treatment process. Where this is the case, backup power supplies will be available from public utilities or from generators at the treatment site.

A few operational phase personnel and their families may relocate as a result of job opportunities provided by this alternative. These families would be accommodated in existing housing and the numbers are too small to have any noticeable effect on the use of local utilities.

Sewage treatment will be improved by implementation of Alternative B4C. In addition, this project would accommodate growth which is expected in the service area. Implementation of this alternative as opposed to the No Project Alternative will mean that the availability of sewage treatment and sewer system hookups will not become factors limiting growth in the service area. Any stresses that this growth may cause on other utilities are considered secondary impacts and are discussed in Chapter IX.

Adequate and uninterrupted sewage treatment will be provided in so far as possible at Hyperion, Sepulveda, and the L.A.-Glendale facilities partially as a result of the operation and maintenance procedures implemented at the treatment plants. Preventive maintenance performed by operating personnel includes lubrication of equipment and machinery, visual inspections, scheduled cleaning, and operation of equipment in test procedures. Preventive maintenance to be performed by the maintenance section includes daily, weekly, monthly, semi-annual and annual inspections. These include visual inspections of all the equipment including primary and final settling tanks which will be dewatered one at a time; and all cables, pumps, and safety equipment. Records are kept of all major inspections and repairs. Corrective maintenance is performed by the service section. This maintenance is in response to deficiencies found by the preventive maintenance program and as a result of any accidental or unscheduled equipment failure. Some plant equipment is maintained by contractual agreement by outside firms or agencies. The computer communication system, security system, and laboratory equipment are in this category.

All plants are manned 24 hours a day and are under the supervision of a licensed Class V operator. All treatment units and plant effluents are monitored in accordance with the requirements of the NPDES permit.

All treatment facilities and equipment are designed to operate smoothly under any foreseeable circumstances. Personnel are trained to respond appropriately to emergency situations as well as to operate facilities under normal conditions. All reasonable measures are taken to provide reliable sewage treatment service to the service area.

(7) ENERGY USE AND CONSERVATION. Table VIII-20 shows the estimated electrical power consumption for primary plus secondary treatment by the activated sludge method. The direct inplant uses of power can be offset by power generated from sludge gas. Additional power is required for chlorine production and for sludge disposal. The Interim Sludge Disposal Project is estimated to require approximately 100 kilowatt-hours per acre foot of wastewater treated. The major uses of power during this operation area for running the basket centrifuges, for trucking material to a landfill, and for chemical treatment of the supernatant. The present system of ocean disposal of sludge has a total power requirement of less than 3 kilowatt-hours per acre foot of wastewater treated.

Providing tertiary levels of treatment requires additional use of power. The City of Los Angeles has estimated the need for 1700 to 1800 kilowatt hours per acre foot of treated wastewater using activated sludge, nitrification - denitrification, multimedia filtration, and activated carbon absorbtion as the means of treatment (Roberts and Hagan, 1975). Providing reclaimed water to fill local needs will reduce power use by the amount required to pump water to the Los Angeles Basin from outside sources. The magnitude of this potential savings has not been calculated.

(8) TRANSPORTATION. Primary operational phase impacts on transportation will result from truck and automobile traffic to and from treatment facilities. The average number of truck and automobile trips per day were estimated above in Section b(3) Air Resources. Treatment facility entrance roads and intersections with local streets will be designed to accomodate this traffic. No impacts on local traffic patterns are expected. Indirect project impacts on traffic are discussed in Chapter IX.

(9) AREAS OF SPECIAL SIGNIFICANCE. No archeological, historical or paleontological resources will be affected by primary impacts of operation of Alternative B4C. Some beneficial impacts on significant aquatic resources may be expected as a result of operation of this alternative.

The improved effluent quality and cessation of sludge discharge will reduce the potential for direct (sublethal and lethal) impacts on marine

Table VIII-20. Total electrical power consumption for primary plus secondary treatment by activated sludge method (KWH/AF) (Roberts and Hagan, 1975).

PROCESS	EPA FIGURES			ORANGE COUNTY			CITY OF L.A.
	1 MGD	10 MGD	100 MGD	46 MGD	175 MGD	175 MGD	340 MGD
Preliminary treatment							
Bar screens	0.50	0.050	0.035				
Comminutors	5.0	2.0	0.66				
Grit removal	0.55	0.11	0.11				
Influent Pumping (30-ft head)	50	47	42				
Primary Sedimentation	10	4.0	2.4				
Activated Sludge Process							
Diffused air aeration	173	173	173				
Recirculation pumping	15	10	10				
Final settlers	10	2.4	2.4				
Chlorination	0.23	0.87	0.87				
Sludge Handling	44.9	7.3	7.3				
Sludge Disposal	36	17	17				
Lights & Misc. Power	19	7.8	7.8				
TOTAL	364	264	264	454	883	853	347-443
Power Generated from Sludge Gas	[204]	[204]	[204]	[301]	[297]	[303]	[359]
Net Power Required	160	60	60	153	586	450	0.84
Chlorine Production	33	33	33	10	99	98	Not reported
Polymer Production					0.08	0.08	
Chemical Transport	1.9	1.9	1.9	0.58	5.6	5.6	
TOTAL	195	118	95	164	691	554	

organisms in the immediate vicinity of the outfalls (see discussion in Chapter III). The reduced mass emissions of toxicants such as heavy metals and chlorinated hydrocarbons will also reduce the potential for bioaccumulation through the food web. In the past, evidence of such bioaccumulation has become apparent in fish (e.g., tuna and swordfish), birds, (e.g., brown pelican) and even man (see Chapter III). A reduction in the nutrients discharged could potentially reduce productivity at all levels of the food web, but this is unlikely to happen for reasons discussed in Chapter III. The reduced discharges of oil and grease may be expected to reduce the formation of surface slicks which act to concentrate wastewater constituents, such as bacteria, and thus reduce the potential for human infection.

3. COASTAL CAPACITY WITH RELIEF SEWER FOR THE SAN FERNANDO VALLEY (C3)

a. Project Summary. Under Alternative C3, 397 mgd of secondary treatment would be provided at the Hyperion Treatment Plant. The only other treatment facility would be the existing 20 mgd L.A.-Glendale Plant. The Additional Valley Outfall Relief Sewer, or AVORS, would be constructed to a capacity of 85 cfs to transport sewage wastes from the San Fernando Valley to the Hyperion Treatment Plant. The Woodman Avenue Relief Sewer, along the same alignment as the proposed EVIS Unit II, would be necessary to enlarge the service area which would be tributary to the AVORS addition. Alternative C3 also includes interim sludge processing at Hyperion Treatment Plant and operation of the Griffith Park Reclaimed Water Delivery System.

Alternative C3 would provide essentially all treatment capacity at the Hyperion Plant. The only inland facility treating wastewater would be the existing 20 mgd L.A.-Glendale Water Reclamation Plant. This alternative has the advantage that only one site would be disturbed for construction of the treatment plant and that all operations would be consolidated at the Hyperion facility. One potential drawback is that expansion of the Hyperion facility to provide 397 mgd of secondary treatment might require unusual and costly engineering because of space limitations. Operation of the AVORS Tunnel and the Woodman Avenue Relief Sewer would provide the hydraulic relief and service area expansion needed in the San Fernando Valley to accomodate projected growth. Reclaimed water would not be available in the San Fernando Valley under Alternative C3. The AVORS plus existing interceptor sewer would have the capacity to carry all expected volumes of sewage from the San Fernando Valley to the Hyperion Treatment Plant during the life of the project.

The 20 mgd L.A.-Glendale Plant could be by-passed during emergency situations. The Hyperion Treatment Plant would be provided with emergency systems and supplies the same as described for the 307 mgd unit in Alternative B4C.

New job opportunities provided in the service area as a result of project operation and maintenance would be for Hyperion, AVORS, the Woodman Ave. Relief Sewer, and the Griffith Park Water Delivery System. Operation of the 397 mgd plant plus the sludge disposal and other project elements would provide approximately 7,886 manyears of employment. The total projected operation and maintenance cost for Alternative C3 is $402,734,000 (in 1975 dollars) for the life of the project. The breakdown for each major project element is shown in Table VIII-21.

Table VIII-21. Summary of primary economic impacts of operation for elements of Alternative C3.

ELEMENT	YEARS COVERED BY O&M	TOTAL O&M COST (1975 $)	O&M PRESENT WORTH	TOTAL O&M DIRECT MY LABOR	TOTAL O&M PAYROLL
HTP Secondary & Modern. 397	1976-2000	$397,154,000	$166,447,000	7767	$116,505,000
AVORS (85 cfs)	1980-2000	3,192,000	1,256,000	68	1,021,000
Griffith Park Recl. Water 9 mgd	1979-2000	2,218,000	910,000	47	710,000
Woodman Ave. Relief Sewer	1984-2000	170,000	57,000	4	54,000
TOTAL		402,734,000	168,670,000	7886	118,290,000

Present worths may differ from some in Facility Plan since Facility Plan at times ascribed discount rate to entire cost of multi-year project at the starting year only.

b. Impact on Physical Elements of the Environment.

(1) SOILS AND GEOLOGY. Major structural damage to sewer or treatment facilities during the life of the proposed project is not anticipated. However, should such an event occur and result in blockage of the AVORS tunnel, the capacity of other sewer systems to remove sewage from the San Fernando Valley could be exceeded by as much as 85 cfs. During most of the project life, sufficient emergency capacity would be available in other major sewer interceptors to avoid overflows of sewage into local streets as a result of interruption in service of AVORS.

As with Alternative B4C, emergency systems would be provided at the Hyperion Plant, but the worst case following damage to facilities would be the discharge of untreated sewage to Santa Monica Bay. Since Alternative C3 calls for the greatest treatment capacity at Hyperion, damage of the plant would result in the greatest discharges to the bay of any of the alternatives considered.

Interim sludge disposal would require significant additional uses of landfill sites. These and other impacts of sludge disposal are being addressed in a separate report. No other primary impacts on soil or topography are anticipated as a result of operation of Alternative C3.

(2) HYDROLOGY. Both the Hyperion Treatment Plant and the L.A.-Glendale Water Reclamation Plant are protected against floods up to the 250 year level or greater. There would be almost no possibility of flood damage to treatment facilities during the life of the Alternative C3 project.

Potable water consumption at the Hyperion Treatment Plant with Alternative C3 would increase slightly over the present condition. This water consumption at Hyperion would probably be somewhat less than the total water consumption for all treatment facilities which would be constructed under Alternative B4C.

Only the existing 20 mgd unit at the L.A.-Glendale plant would provide reclaimed water. The City's share of this water is approximately 9 mgd which will be used in irrigation of Griffith Park. As with B4C, the secondary treatment capacity at Hyperion does not provide for any additional treatment necessary prior to most types of wastewater reuse. Furthermore, the limitation of space at Hyperion would effectively preclude later development of tertiary treatment facilities there. Treatment at other sites, or off-site uses of water would require uphill pumping with attendant equipment and energy costs, the same as with B4C.

Alternative C3 includes construction of the Griffith Park Reclaimed Water Delivery System. This would mean that the 9 mgd available to the City of Los Angeles would be used for irrigation and would not be discharged to the Los Angeles River. If the City of Glendale's 9 mgd were also used, as proposed, rather than discharged to the river, there would be no flow of reclaimed water in the Los Angeles River. As with other alternatives, operation of the Griffith Park Reclaimed Water Delivery System is independent of other project elements and could be implemented or not without affecting other elements of an alternative.

Water quality impacts on the ocean are expected to be similar to those described for Alternative B4C, since the effluent quality will be the same and ocean sludge discharge terminated for both alternatives. The areal extent of the plume will be greater as a result of the approximately 30 percent larger discharge volume for Alternative C3. The impacts of terminating the ocean discharge of sludge on the water and sediment quality in Santa Monica Bay are discussed under Alternative B4C.

The total percentage change in mass emission of sewage constituents as compared to the present discharges are shown in Table VIII-19. Mass emissions of all but TDS, and inorganic nitrogen will be reduced by this alternative.

(3) AIR RESOURCES. Air resources will be adversely impacted by additions to the level of vehicular emissions resulting from the operation of Hyperion Treatment Plant. Vehicle trips would be similar to those

required for operation of the 307 mgd Hyperion unit. Probably another 4 to 5 truck trips per day would be required at HTP as a result of the need for disposal of additional grit screened out in the primary phase of treatment and additional delivery of supplies required because of the larger capacity provided at Hyperion. Approximately the same number of employees would be needed as for the 307 mgd unit so emissions from commuting would be the same. Although vehicular emissions generated as a result of operating the Hyperion Treatment Plant would be greater than for Alternative B4C there would be no vehicular emissions resulting from operation of additional treatment facilities (except for 20 mgd L.A.-Glendale which is not technically part of the project). The total emissions resulting directly from operation of Alternative C3 probably would be slightly less than for Alternative B4C.

Odors presently generated during operation of Hyperion would be greatly reduced following construction. There would be no other treatment facility projects included in this alternative which could generate odors.

(4) NOISE. Operation of the 397 mgd facility at Hyperion would produce noise levels similar to those described for the 307 unit in Alternative B4C. Some of the facilities for the larger Hyperion unit would be closer to residential areas than if the 307 mgd unit were constructed under Alternative B4C. Because of the closer proximity of the treatment work, noise levels in the residential areas would be greater if Alternative C3 were implemented.

c. Impacts on Biological Elements of the Environment.

(1) TERRESTRIAL ECOSYSTEMS. Primary impacts of Alternative C3 on terrestrial ecosystems would be limited to the use of landfills for disposal of sludge and the use of presently unoccupied space at the Hyperion Treatment site. Landfill impacts are treated in a separate report.

The only space used for proposed treatment facilities under Alternative C3 would be at the Hyperion site. Loss of existing habitat is discussed in the section on construction phase impacts. Operational phase impacts will be simply the continued use of this area for treatment facilities.

(2) AQUATIC ECOSYSTEMS. Implementation of Alternative C3 will result in no discharge of reclaimed water to the Los Angeles River. Should the Griffith Park Reclaimed Water Delivery System be eliminated from the proposed project, 9 mgd of reclaimed water could be discharged to the Los Angeles River from the existing 20 mgd L.A.-Glendale Water Reclamation Plant. Because the Sepulveda facility would not exist, there would be no opportunity for discharge of reclaimed water into the Los Angeles River in the San Fernando Valley Region. Discharges of between 9 and 18 mgd of reclaimed water to the Los Angeles River from the L.A.-Glendale Plant are discussed under the No Project Alternative. The

impacts of no discharges of reclaimed water to the L.A. River would be a return to the conditions present before LA-GWRP went into operation (see Chapter II).

The impacts of discontinuing sludge disposal in the ocean are discussed under Alternative B4C. The impacts of discharging 393 mgd of secondary effluent through the 5-mile outfall at Hyperion would be similar to the impacts discussed in Alternative B4C for a 307 mgd discharge. The effluent quality will be the same, and thus, the main difference in impacts will be related to the differences in volume. Discharge of 28 percent more effluent will increase the size of the wastewater plume.

d. Impact on Socioeconomic Elements of the Environment.

(1) LAND USE AND AESTHETICS. The proposed changes to the Hyperion Treatment Plant are the only elements of Alternative C3 that will have primary impacts on land use and aesthetics during the operational phase. Treatment facilities will occupy a greater portion of the Hyperion site than at present. The residential neighborhood to the east of Hyperion will be closer to project structures. The Hyperion Treatment Plant will be comewhat more visible from residential areas and from streets surrounding the plant. Views of the ocean from nearby residential areas will not be blocked by the new facilities at Hyperion. The greatest change will be increased visibility of the plant from Vista Del Mar and Imperial Highway.

The AVORS, the Woodman Avenue Relief Sewer, and the Griffith Park Reclaimed Water Delivery System will not have direct operational phase impacts on land use or aesthetics. Secondary impacts resulting from operation are discussed in Chapter IX.

(2) POPULATION. The operational phase of Alternative C3 will have extremely limited direct impacts on population distribution. Employee requirements for operation of Hyperion Treatment Plant could result in the relocation of several families into the project area. No more than a few families would be expected to relocate as a result of these job opportunities. Total number of people involved would be a very small fraction of the local population. This impact would be very slightly greater than that of Alternative B4C for the Hyperion Treatment Plant vicinity but there would be no relocations at other sites.

(3) EMPLOYMENT. Operation of the 397 mgd Hyperion plant would provide 7,767 manyears of employment. The total operational phase employment opportunity for Alternative C3 (7,886 manyears) would be somewhat less than for Alternative B4C (9,314 manyears) because of the consolidation of nearly all treatment capacity at a single site.

(4) ECONOMY. The total wages paid for operation of Alternative C3 will be $118,290,000 as opposed to $96,510,000 for operation of the No Project Alternative. Total operation and maintenance costs including wages are estimated to be $402,734,000. Table VIII-21 shows these costs by major project element.

(5) COMMUNITY SERVICES. No noticeable direct project impacts from the operational phase are expected on community services. The needs for the use of schools, health care, and other community services of the few people expected to relocate as a result of job opportunities will be accomodated by existing services.

(6) UTILITIES. As for community services, there will be no noticeable impact on utilities as a result of relocated families having a wage earner employed at the Hyperion Treatment Plant.

Operation of the 397 mgd Hyperion Treatment Plant will require potable water and power supplies and communication systems. These needs can be supplied from existing systems with no effect on other utility users.

Improvements in sewage treatment, and maintenance of the facility will be the same as discussed for Alternative B4C. The presence of the Woodman Avenue Relief Sewer and the AVORS tunnel will mean that this alternative would accomodate the growth which is expected in the San Fernando Valley. The availability of sewage treatment and sewer hookups would not become limiting in the service area within the project lifetime.

(7) ENERGY USE AND CONSERVATION. Direct energy needs for operation of Alternative C3 would be less than for operation of Alternative B4C. This would be due mainly to the fact that Alternative C3 does not provide tertiary treatment of any wastewater except at the existing 20 mgd L.A.-Glendale facility. The energy requirement of importing additional water into the project area instead of using reclaimed water has not been calculated.

Power requirements for sludge disposal would be the same as described in Alternative B4C for operation at the Hyperion Treatment PLant. However, energy savings would be realized by not treating to remove sludge at upstream facilities and then returning solids to the system to be removed again at Hyperion. This process would occur only at the 20 mgd existing L.A.-Glendale unit. The excess energy expenditures for duplicate sludge removal from the additional 95 mgd of inland treatment provided by Sepulveda and the L.A.-Glendale addition would not occur with Alternative C3.

(8) TRANSPORTATION. Primary operational phase impacts on transportation would result from truck and automobile traffic to and from the Hyperion Treatment Plant. There would be approximately 60 truck trips and 100 automobile trips each day, to and from the facility. Entrance roads and intersections with local streets would be designed to accommodate this traffic. As for Alternative B4C, no impacts on local traffic patterns are expected.

(9) AREAS OF SPECIAL SIGNIFICANCE. No archaeological, historical or paleontological resources would be affected by primary impacts of operation of Alternative C3. Beneficial impacts on the marine environment would be similar to those described for Alternative B4C.

4. INLAND-COASTAL SPLIT WITH MAXIMUM POTENTIAL FOR RECLAMATION (E2)

a. Project Summary. Alternative E2 includes project elements that would allow a maximum amount of water reclamation. Project elements are similar to those proposed for Alternative B4C with the major exceptions that a 75 mgd La Cienega Water Reclamation Plant would be operational in 1986 and that the initial 307 mgd unit at Hyperion would be modified after 1986 to treat 232 mgd with 50 mgd receiving advance treatment for reclamation. Provisions for including this flexibility in the 307 mgd Hyperion Unit would be complete in 1980, and the reduction in plant capacity would be implemented following start-up of the La Cienega Water Reclamation Plant.

Proposals for constructing and adding to the Sepulveda Plant and the Los Angeles-Glendale Water Reclamation Plant are the same as described for Alternative B4C. Other common project elements include the Interim Sludge Processing and Disposal Program, the East Valley Interceptor Sewer Units I and II, the Griffith Park Reclaimed Water Delivery System, and the Sepulveda Dam Recreation Area Reclaimed Water Delivery System. As with other alternatives, implementation of the Interim Sludge Program and operation of the Griffith Park Reclaimed Water Delivery System are independent of other project elements.

After completion of all project elements the maximum amount of reclaimed water that would be produced by Alternative E 2 is 85 mgd at Sepulveda, 30 mgd at L.A.-Glendale, 75 mgd at La Cienega, and 50 mgd at Hyperion for a total of 240 mgd. This is almost 60 percent of the wastewater treated by the system.

In addition to meeting objectives for maximum reclamation of wastewater, this alternative would provide hydraulic relief to the San Fernando Valley and would meet State and Federal requirements to provide full secondary treatment of effluents discharged to receiving waters and to discontinue sludge disposal to the ocean. Disadvantages to the plan are the large capital investment required to construct the La Cienega Water Reclamation Plant, the additional expense of converting Hyperion from 307 mgd of secondary treatment capacity to 232 mgd capacity including 50 mgd of advanced treatment, and the high operation and maintenance costs.

Normal, wet weather and emergency operations under Alternative E2 would be the same as described for Alternative B4C with the exception of operations at the La Cienega Water Reclamation Plant. The proposed location for La Cienega is not subject to flooding, and operation would not be directly limited by major rainfall events so long as effluents were being used rather than discharged to Ballona Creek. Since Ballona Creek has a capacity less than that required to accomodate flows from a 50-year storm, the discharge of effluents from La Cienega to the creek during major storms might be prohibited. If this were the case, flow to the La Cienega Water Reclamation Plant would be bypassed and remain in the NOS-LCFVRS and be treated at HTP. Since this sewer system has the capacity needed for all system flows up to the year 2000, bypassing La Cienega would not cause sewer overflows.

As with other treatment facilities, La Cienega would have a dual power system to assure operation in the event of a power failure, and storage capacity for supplies sufficient to allow operation for several days without deliveries. Should emergency systems at the plant fail, the bypass system would be used to divert flow to Hyperion.

Employment for operation and maintenance of the La Cienega Water Reclamation Plant would be about the same as for operation and maintenance of the Sepulveda 40 mgd unit plus 30 mgd unit totaling about 60 jobs. The total projected operation and maintenance cost for Alternative E2 is $511,061,000 (in 1975 dollars). The operational costs for each major project element are shown in Table VIII-22.

b. Impacts on Physical Elements of the Environment.

(1) SOILS AND GEOLOGY. Alternative E2 has the greatest flexibility for operation in the event of a major earthquake causing structural damage to facilities. Because treatment would be provided at four different sites, disabling destruction to the entire system is highly unlikely. Bypass capabilities in the system would be the same as described for Alternative B4C with the additional factor that the La Cienega Plant, like L.A.-Glendale, could be bypassed entirely using available sewer capacity.

The use of landfill sites as a result of implementation of the Interim Sludge Disposal Project is discussed in a separate report. No other primary operational phase impacts related to soils or geology are anticipated.

(2) HYDROLOGY. Operational impacts during flood conditions for Hyperion, L.A.-Glendale, and Sepulveda would be the same as described in

Alternative B4C. Treatment capability at the La Cienega Water Reclamation Plant would not be threatened by flooding. If effluents from the La Cienega Plant were not used in reclaimed water systems and could not be discharged to Ballona Creek during major storms, the flow bypassed to Hyperion Treatment Plant would place an extra load on that system. If this occurred while the 307 mgd capacity at Hyperion were still available, no change in Hyperion effluent quality would occur. If Hyperion had been converted to a 232 mgd capacity, the increased effluent volume to the plant might require a temporary stop in production of the 50 mgd of reclaimed water or a temporary reduction in the quality of effluent discharged to the ocean.

Table VIII-22. Summary of primary economic impacts of operations for elements of Alternative E2.

ELEMENT	YEARS COVERED BY O&M	TOTAL O&M COST (1975 $)	O&M $ PRESENT WORTH	TOTAL O&M DIRECT MY LABOR	TOTAL O&M PAYROLL
HTP Secondary & Modern. with Flex. 307	1976-2000	$371,582,000	$158,604,000	7767	$116,505,000
Sepulveda 40 mgd	1979-2000	44,968,000	18,456,000	990	14,850,000
Sepulveda 30 mgd added	1981-2000	22,580,000	8,528,000	320	4,800,000
Sepulveda 15 mgd added	1994-2000	3,948,000	899,000	56	840,000
La Cienega 75 mgd WRP	1986-2000	58,500,000	18,057,000	990	14,850,000
EVIS I	1980-2000	588,000	231,000	12.5	188,000
EVIS II	1984-2000	289,000	97,000	6.2	92,000
LAGWRP 10 mgd added	1989-2000	4,956,000	1,361,000	84	1,260,000
Griffith Park Recl. Water 9 mgd	1979-2000	2,218,000	910,000	47	710,000
Sepulveda Dam Recl. Water 9 mgd	1981-2000	1,432,000	541,000	31	468,000
TOTAL		511,061,000	207,684,000	10,304	154,553,000

Present worths may differ from some in Facility Plan since FAcility Plan at times ascribed discount rate to entire cost of multi-year project at the starting year only. 37 was labor cost factor and $15,000 was average salary.

If the water from LCWRP were not reused, discharges to Ballona Creek could amount to 75 mgd, which would increase summer flow by as much as 420 percent and winter flow by about 10-15 percent (see Chapter II), except during major storms. Due to the extreme natural variability in creek flow, effluent from LCWRP will help stabilize low flow periods and eliminate most stagnant shallow pools. Freshwater outflow from the creek into the ocean will also increase the size of the brackish water zone both in the channel of the creek and at the ocean interface.

Potable water consumption at treatment facilities during operation of Alternative E2 would be slightly greater than during operation of Alternative B4C because of the greater number of treatment facilities.

Up to 240 mgd of reclaimed water would be available for reuse with Alternative E2. This is 125 mgd more than for Alternative B4C, 210 mgd more than for Alternative CX, and 220 mgd more than for Alternative C3. Potential uses of reclaimed water are examined in Addendum #1.

The effluent quality from secondary treatment of Hyperion, and from advanced treatment at Sepulveda and L.A.-Glendale would be the same as described for Alternative B4C. Effluent quality from LCWRP will be similar (Table VIII-13) to that of SWRP, and the water quality of Ballona Creek is assumed to be similar to that of the L.A. River. Thus, water quality impacts upon Ballona Creek are expected to be similar to those of SWRP upon the L.A. River (See Alternative B4C), including chlorination impacts.

The constituent concentrations and mass emissions for the HTP secondary effluent are shown in Tables VIII-14 and VIII-18. The impacts on the water quality of Santa Monica Bay would be the same as those described in Alternative B4C until the volume is reduced to 232 mgd or 182 mgd if 50 mgd are reclaimed. At that time, the size of the plume and the mass emissions would decrease.

(3) AIR RESOURCES. Direct operational phase impacts of Alternative E2 on air resources would be similar to those described for Alternative B4C as a result of operation of the Sepulveda and L.A.-Glendale facilities. Emissions resulting from operation of Hyperion following conversion to a capacity of 232 mgd could be somewhat reduced from the impacts described for Alternative B4C. Operation of the La Cienega Plant would result in emissions due to truck trips and commuting employees. The quantity of emissions generated due to operation of the La Cienega facility would be similar to that generated during operation of Sepulveda. Vehicular emissions from traffic generated by the existing FedCo store would not occur (at least at the same site) during operation of the treatment plant. The net change would be a reduction in emissions generated due to use of the proposed site. Air pollutants generated indirectly for production of supplies and power have not been calculated.

As with other alternatives, odor generation would be substantially reduced at Hyperion and would not be expected to result from normal operations of other treatment facilities.

(4) NOISE. Noise levels described for the operation of Hyperion, Sepulveda, and L.A.-Glendale would be the same as for Alternative B4C. On-site noise levels for operation of the La Cienega Water Reclamation Plant would be similar to conditions at Sepulveda. However, because of residential areas near the proposed La Cienega site, potential noise impacts might require mitigation measures which could be included in designs for the treatment plant.

c. Impact on Biological Elements of the Environment.

(1) TERRESTRIAL ECOSYSTEMS. Primary impacts of Alternative E2 on terrestrial ecosystems would be the same as those described for Alternative B4C. There would be essentially no additional impact as a result of the La Cienega Water Reclamation Plant since structures on the existing highly urbanized site would be replaced by other structures also providing highly urbanized habitat.

(2) AQUATIC ECOSYSTEMS. The primary impact of effluents from Sepulveda and L.A.-Glendale on aquatic ecosystems would be the same as described for Alternative B4C. If full use were made of the 50 mgd of reclaimed water produced at Hyperion, only 182 mgd of secondary effluent would be discharged through the 5-mile outfall. The impacts of this discharge to Santa Monica Bay would be similar to those in Alternative B4C, but the potential for bioaccumulation of heavy metals and chlorinated hydrocarbons would be reduced as a result of the approximately 40 percent lower mass emissions rate. The size of the wastewater plume would also be smaller and fewer nutrients (nitrogen and phosphate) would be available for use by primary producers.

It is probable that all 75 mgd of reclaimed water produced at the La Cienega Water Reclamation Plant would be used for irrigation or industrial purposes. Any unused effluent would be discharged to Ballona Creek following conversion of Hyperion from 307 mgd to 232 mgd capacity. Because of the tremendous flushing action of seasonal rains, little perennial vegetation survives in the channel from year-to-year. Augmented flows resulting from LCWRP discharges would further inhibit perennial plant growth by maintaining a moderate water depth in the downstream channel. Emergent vegetation is also limited by the abrupt, vertical concrete walls and rip-rap. Nuisance algal growths would also be minimized by increased water depth as would nuisance insects. A modest increase in benthic invertebrates and plankton populations would be expected from increased flow, especially during summer low-flow periods. At the mouth of Ballona Creek, the increased fresh water output may eliminate some of the more halophytic attached benthos (see Chapter III) while at the same time allow greater encroachment of brackish water biota (as discussed in Alternative B4C for the mouth of the L.A. River).

The impact of sludge removal from the ocean discharge would be the same as described for Alternative B4C.

d. Impact on Socioeconomic Elements of the Environment.

(1) LAND USE AND AESTHETICS. Primary project impacts on land use and aesthetics would be the same as described as for Alternative B4C with additional impacts occurring at the La Cienega Water Reclamation Plant site. The major direct impact on land use of the La Cienega Water Reclamation Plant would be to use a 25-acre site presently occupied by a FedCo store and parking lot for sewage treatment facilities from 1986 thru the year 2000. Impacts resulting from the conversion between these

uses are discussed in the section on construction phase impacts (VIII.A.4). During the operational phase, the aesthetics of a well landscaped sewage treatment facility would be more desirable to most observers than the existing FedCo. store and parking lot. Traffic and vehicular emissions resulting from use of the site would be less for the treatment facility than for the existing store. Noise, odors, and other factors affecting the aesthetic quality of the site probably also would be improved by replacement of the existing use with the treatment facilities. Adverse impacts due to generation of odors would result only from a serious malfunction of the plant. No such events are anticipated, and because complete bypass of the plant is possible, any odor causing problems would be of short duration.

(2) POPULATION. Primary operational phase impacts of Alternative E2 will be the same as those described for Alternative B4C with the additional possibility that a few families may relocate due to employment opportunities at the La Cienega Water Reclamation Plant.

(3) EMPLOYMENT. Employment requirements for operation of Hyperion during the 307 mgd phase would be the same as described for Alternative B4C. Employment at Hyperion after conversion of the plant to 232 mgd capacity has not been determined. Employment for operation of Sepulveda and the addition to L.A.-Glendale would be the same as described for Alternative B4C. Employment opportunities at the La Cienega Water Reclamation Plant would be similar to those described for Sepulveda. A total of 10,304 manyear of labor would be required for the operation of Alternative E2.

Indirect employment opportunities resulting from related jobs within the city and from other jobs created by increased expenditures in the project area are discussed in Chapter IX.

(4) ECONOMY. Primary project impacts on the economy will result from wages paid to operation and maintenance personnel. The total wages to be paid for operation of Alternative E2 are expected to be $154,553,000 (1975 dollars). Total operation and maintenance costs including wages are estimated to be $511,061,000 (1975 dollars). Table VIII-22 shows operational costs by major project elements.

(5) COMMUNITY SERVICES. The availability of reclaimed water as a result of operation of Alternative E2 would permit irrigation of public recreation facilities at a cost lower than that required if water were imported specifically for this purpose. In a few cases it is possible that the known availability of reclaimed water would lead to development of parks in areas which otherwise would not be developed for intensive use. Recreational uses of water in addition to those described for the Sepulveda Dam and Griffith Park areas are discussed in Addendum #1.

Because the number of families which might relocate for employment opportunities at treatment facilities is very small, no noticeable resulting impacts on community services are anticipated.

(6) UTILITIES. As for community services, there will be no noticeable impact on utilities as a result of relocations of treatment facility employees and their families.

Potable water, power, and communications needed for the operation of treatment facilities will be supplied from existing systems with no impact on other utility users.

Implementation of Alternative E2 will provide sewage treatment for the service area adequate to meet population growth expected to the year 2000. Sewage treatment and sewer system hookups would not become limiting factors in the service area during the life of the project.

Inspections and maintenance as described for Alternative B4C will apply to La Cienega Water Reclamation Plant as well as other treatment facilities.

(7) ENERGY USE AND CONSERVATION. Energy use during operation of Alternative E2 would differ from that described for Alternative B4C by the additional amount of tertiary treatment provided for maximum reclamation. The savings in energy which would offset this impact as a result of reduced needs for water importation has not been calculated.

(8) TRANSPORTATION. Primary operational phase impacts on transportation due to truck and automobile traffic to and from treatment facilities would be the same as described for Alternative B4C for the Hyperion, Sepulveda, and the L.A.-Glendale plants. The amount of traffic generated at the La Cienega Plant would be similar to that generated at the Sepulveda Plant with 70 mgd capacity. The net effect on traffic at the La Cienega site would be to reduce trips from the number presently occurring due to use of the FedCo store. Traffic conditions at the La Cienega site would be better during operation of the treatment facility than at present.

(9) AREAS OF SPECIAL SIGNIFICANCE. No archaeological, historical or paleontological resources would be affected by primary impacts of operation of Alternative E2. Potential beneficial impacts on significant aquatic resources would be the same as described for Alternative B4C.

C. impacts of location and growth

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C. IMPACTS OF SUBSIDIARY ALTERNATIVES

Three subsidiary project issues involve chlorination, removal of existing secondary clarifiers, and the most cost-effective method for full secondary treatment. These were discussed in Section VII.C.4. The impacts of the various alternative project designs relate mainly to wastewater quality and monetary expense.

1. CHLORINATION

Chlorination results in the production of toxic chlorinated compounds which are discharged in addition to free residual chlorine. The maximum allowable residual chlorine is 1 mg/1 (30-day average) and 2 mg/1 daily by the NPDES permits. A determination will be made of the benefits and drawbacks acceptability of chlorination for the Final EIS. The potential benefit of chlorination is the protection of public health by the reduction of bacteria which may reach the beaches during strong onshore currents or winds. The drawbacks of chlorination include direct toxicity to marine organisms and the production of chlorinated organic compounds which may also be directly toxic or may be bioaccumulated by marine organisms.

2. SECONDARY TREATMENT METHODS AND THE REMOVAL OF EXISTING CLARIFIERS

The marine impact discussion presented in this chapter is based on the assumption that the secondary treatment system at HTP will aerate entirely with pure oxygen (UNOX). The existing secondary facilities which aerate with air and have a capacity for treatment of 100 to 150 mgd of wastewater will be removed. If the existing system were retained, it would not be necessary that wastewater receiving only primary treatment be discharged during the 3-year construction phase. (Refer to Table VIII-4 and the accompanying discussion of impacts.) Also, it would be inefficient to remove an adequate existing system. Other arguments maintain that available space limits the type of facilities that can be installed, and that operations would be complicated by the use of two different types of secondary treatment. A full investigation of the secondary treatment alternatives requires more detailed engineering analyses.

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D. references

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Chapter IX

secondary impacts

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A. introduction

A. INTRODUCTION

Many major projects, in particular, those that involve the construction of such "infrastructure" systems as highways, airports, sewer systems, water resource projects, and the like, may stimulate, induce, or accommodate secondary effects in the form of changed patterns of social and economic activities, and subsequent environmental impacts. Secondary effects, through these impacts on existing community facilities and activities and through inducement of new facilities and activities, may often be more substantial than the primary effects of the original action itself. The effects of the proposed action on population and growth and the resultant effects on the environment may be among the more significant secondary effects. For this reason, such secondary impacts must be analyzed and evaluated in Environmental Impact Statements.

The issue with regard to secondary impacts is to determine what current constraints exist to growth, what projections there are for future growth, and what contribution the Facilities Plan Alternatives make to growth and concomitant secondary impacts. Mitigative measures can then be implemented to reduce the secondary impacts to an acceptable level so that environmental goals of water and air quality can be concurrently achieved.

The EPA (Environmental Protection Agency, 1975) requires that secondary impacts be addressed in Environmental Impact Statements for construction of facilities, to include:

> "(i) induced changes in the pattern of land use, population density and related effects on air or water quality or other natural resources;
>
> "(ii) increased growth at a faster rate than planned for or above the total level planned by the existing community."

Similarly, the State of California (State EIR Guidelines, 1977) requires description of "changes induced in population distribution, population concentration, the human use of the land (including commercial and residential development) and other aspects of resource base such as water, scenic quality and public services" (Section 15143).

Analysis of secondary impacts inevitably involves consideration of the plans and policies adopted or being developed for the region under consideration. Although growth could occur in a given area, barring other considerations, it will not occur if plans and policies are implemented to stop growth, or will occur only to the extent permitted by such plans and policies. Environmental assessment is necessarily integrated into the planning process, since planning, fully implemented, shapes the future environment and brings with it a wide range of potential impacts.

The data management requirements for both direct and secondary impacts are both numerous and diverse. The Future Los Angeles Growth (FLAG) computerized information system (Figure IX-1) was developed to store a wide range of data on the regional structure (physical, biological, and socioeconomic), as well as potential constraints to growth, and process these data in response to alternative project-related and mitigative measure growth scenarios.

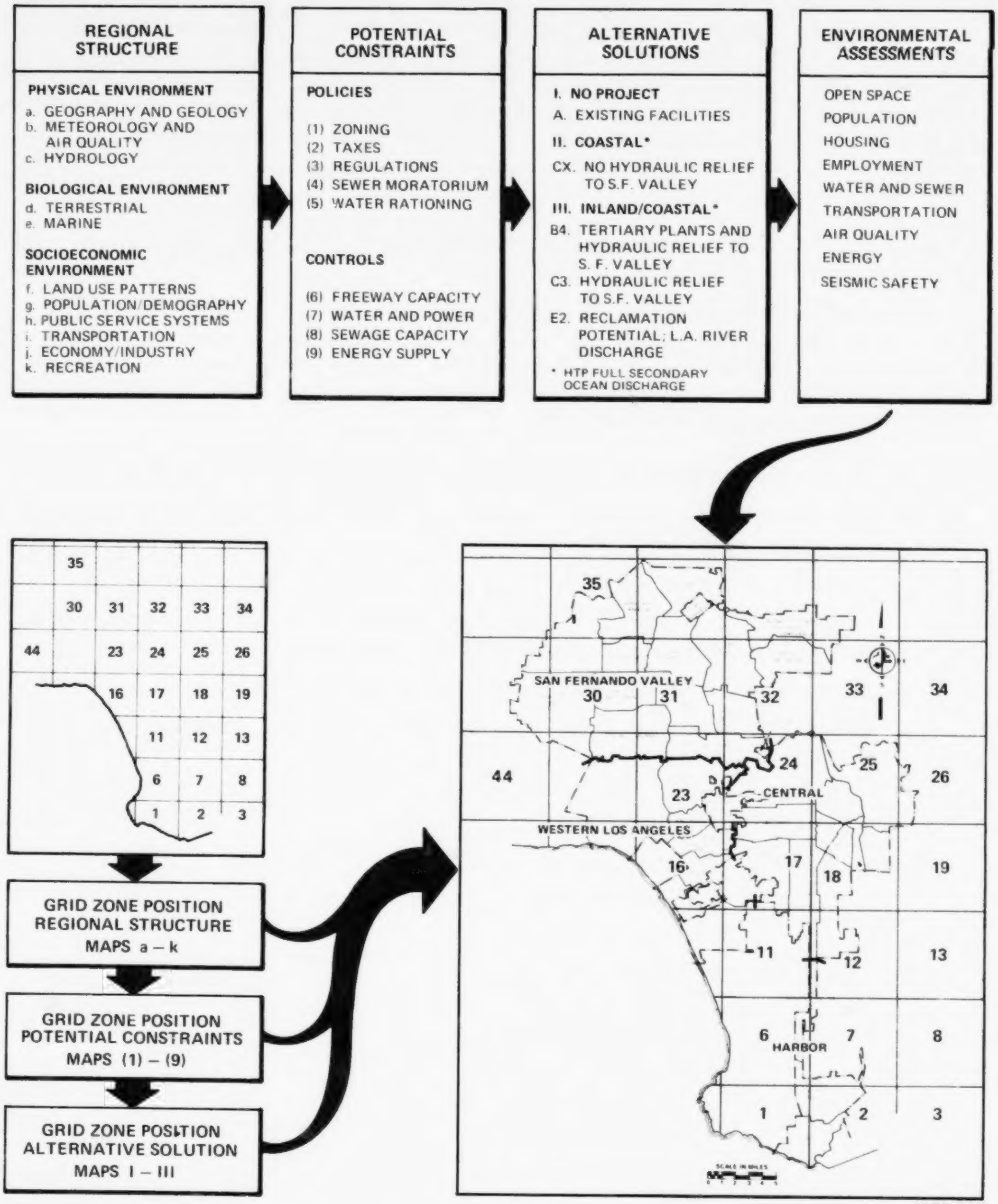
The FLAG system results in two products:

- a quantified description of the environmental setting summarized on basic data maps
- composite areas of potential impacts related to the various growth scenarios

To keep the computational requirements within manageable proportions, the smallest area considered in the FLAG analysis is the basic 10 by 10 kilometer square, as shown overlayed on a map of the 35 planning areas within the service area. For ease of interpretation, results are frequently presented in terms of the four major areas of the City, also shown on the figure: the San Fernando Valley, Western Los Angeles, Central Los Angeles, and the Harbor.

Typical impacts of growth include increases in automobile traffic with its associated air pollution, pressures upon existing utilities, highways, and public services (schools, hospitals, fire protection, etc.), and the loss of open space as undeveloped land is converted to urban expansion. The Hyperion Service Area is expected to grow by 195,000 (6 percent) between 1975 and 1990, and 310,000 (10 percent) between 1975 and 2000.

Because the Los Angeles area lies within a critical air basin that faces problems in attaining the goals of the Clean Air Act, substantial attention has been focused on the possibility that implementation of the Los Angeles Facilities Plan will lead to degraded air quality as a secondary impact of plan implementation. Also, there is concern that provision of additional sewage service in the San Fernando Valley will lead to an increase in population north of the mountains at the expense of the City area south of the mountains, producing increased vehicular traffic, and consequent decreased air quality in the north part of the City. This analysis of secondary impacts has thus provided special emphasis on air quality factors as they may be related to implementation of plan alternatives.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PHYSICAL ENVIRONMENT
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b. METEOROLOGY AND AIR QUALITY
c. HYDROLOGY
BIOLOGICAL ENVIRONMENT
d. TERRESTRIAL
e. MARINE
SOCIOECONOMIC ENVIRONMENT
f. LAND USE PATTERNS
g. POPULATION/DEMOGRAPHY
h. PUBLIC SERVICE SYSTEMS
i. TRANSPORTATION
j. ECONOMY/INDUSTRY
k. RECREATION
POTENTIAL CONSTRAINTS
POLICIES
(1) ZONING
(2) TAXES
(3) REGULATIONS
(4) SEWER MORATORIUM
(5) WATER RATIONING
CONTROLS
(6) FREEWAY CAPACITY
(7) WATER AND POWER
(8) SEWAGE CAPACITY
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C3. HYDRAULIC RELIEF TO S.F. VALLEY
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* HTP FULL SECONDARY OCEAN DISCHARGE
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POPULATION
HOUSING
EMPLOYMENT
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AIR QUALITY
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WESTERN LOS ANGELES
HARBOR
SCALE IN MILES

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Figure IX-1. Future Los Angeles Growth (FLAG) computerized information system.

1. BASIS FOR EVALUATION OF SECONDARY IMPACTS

The extent to which sewer system development will facilitate, induce, or accommodate growth is uncertain. This analysis assumes that populations will grow in accordance with the projection prepared by the Southern California Association of Governments (SCAG-76), and used to develop the Facilities Plan. Different distributions of this population have been evaluated, in both Chapters IX and X, to consider potential impacts and effects that could result from regional and local policy decisions. The SCAG-76 projection anticipates somewhat higher 1990 populations for the Hyperion service area than does the forecast by the State Department of Finance DOF-EO series, and somewhat lower population than that projected by the SCAG-EO and the City Plan.

The SCAG-76 population projection has been used in the Facilities Plan as the basis for projecting wastewater flows and sizing treatment plants. The SCAG forecasts allocated the growth to Regional Statistical Areas (RSAs) based on land and public service availability. The policies that influenced this forecast are:

- encourage growth in and adjacent to the existing urban areas
- avoid excessive housing recycle and resulting community disruption
- avoid densities that work to overtax the existing and currently planned infrastructure
- preserve, whenever possible, the region's natural resources and desirable land uses, particularly prime agricultural lands
- balance population with jobs within each major subregion
- support the policies of SCAG's Regional Transportation Plan (SCAG, 1975)

B. future development prospects

B. FUTURE DEVELOPMENT PROSPECTS

1. UTILITIES BASELINE DEMAND PROJECTIONS

This section is designed to identify what limiting factors could serve to shape or otherwise influence growth in addition to wastewater treatment capacity. The available utilities and their constraints are discussed to attempt to establish what increment of growth accommodation could be attributed to the implementation of the Facilities Plan. Future development will create an unavoidable demand for public utilities, energy resources, and community services. The magnitude of this demand will vary with:

- the type of development
- its location
- the socioeconomic factors specific to the community (i.e., income life style, housing type, utility rates, taxes, etc.)

The City of Los Angeles provides its residents with several municipal services including:

- electrical power
- natural gas
- water supply
- wastewater treatment
- solid waste disposal

In addition to the above services, the City also provides police and fire protection, schools, libraries, an international airport, and an important harbor facility. Natural gas supplies are provided by the Southern California Gas Company. Growth in the Hyperion Service Area will create demand for these public services in varying degrees. Growth in the City is projected by the SCAG-76 forecast as given in Table IX-1.

The relatively low increases throughout the City indicate that the high post World War II growth rates have slowed considerably, and that minor increases are forecasted for future years, as shown by the comparison of the base year 1970 and the 1990 projections.

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Table IX-1. SCAG-76 growth projections by city area.

LOCATION	1970	1990	PERCENT INCREASE
Central	1,335,949	1,357,773	2
San Fernando Valley	967,128	1,160,679	20
West Los Angeles	355,467	389,329	10
Harbor	153,257	170,331	11
CITY TOTALS	2,811,801	3,078,112	9

a. Electrical Energy Usage. Electrical energy for the service area is supplied by the City of Los Angeles Department of Water and Power (DWP). Increased urban development will create additional demands for electrical energy. The demand for electricity is expected to increase to 80 GWHPD (26.0 KWH PCD) by 1990 in L.A. City. It is not certain whether or not enough power can be obtained from new generating sources to meet the future demand; however, the development of nuclear power could provide the needed supply. In 1974, the peak demand on DWP's generating facilities was about 3,875 megawatts, or about 67 percent of their peak generating capacity of 5,779 megawatts. DWP plans to increase generating capacity to meet projected energy demands as shown in Table IX-2.

Column one on the Table is the projected annual load in megawatt hours of energy. Columns two and three show the projected annual peak demand and projected net resource capabilities in megawatts. Since these figures include industrial and commercial requirements, as well as residential consumption, the 1990 energy load estimate is about 50 percent higher than the per capita estimate shown in Table IX-2.

Table IX-3 indicates a great increase in total electrical power use by 1990 in the San Fernando Valley. This increase is anticipated in conjunction with a growth in population in the San Fernando Valley of almost 200,000 people over the period of 1970-1990 (about 72 percent of the 1990 projected SCAG-76 growth for the entire city).

Present differences in consumption rates between the four main regions of the city will remain (for the same reasons) and single family unit numbers will most likely continue to consume 10 to 20 percent more electricity than multi-family residents. However, concentrated use in one part of the city is not significant in the relationship of demand capacity versus production capacity since almost all electricity is produced outside of Los Angeles.

Table IX-2. Actual and projected load and net resource capability for Los Angeles Department of Water and Power.[1]

YEAR	ENERGY LOAD (MEGAWATT HOURS)	PEAK DEMAND (MEGAWATTS)	NET CAPABILITY (MEGAWATTS)
1974	18,366	3,875	5,779
1975	16,269[2]	3,500[2]	4,679[3]
1980	23,430	5,183	7,454
1985	30,972	6,590	9,512
1988	36,766	7,617	10,419
1990	40,856[4]	8,390[4]	11,476[4]

[1] Extracted from San Joaquin Nuclear Project-Draft Environmental Impact Report, 22 April 1975.

[2] "Statistics," Fiscal Year 1974-75, Los Angeles Department of Water and Power.

[3] "Supplemental Report" (to Annual Report for the Fiscal Year ended 30 June 1975), Los Angeles Department of Water and Power.

[4] Estimated by HDR.

b. Natural Gas. Natural gas use in the service area is expected to continue over the next 15 years despite the possibility of significant shortages. Conservation efforts have been instrumental in reducing residential consumption from about 120 cubic feet per person per day in 1972, to about 102 cubic feet in 1975 (Southern California Gas Company, 1976). Restricted deliveries to steam electric generating plants, industry, and some commercial customers resulted in a reduction in gas consumed of 37 percent in 1974 from total stated requirements (ARB, 1975). Net consumption within Southern California was about 2,579 million cubic feet per day (mmcf/d) in 1974, as a result of both conservation and restricted delivery policies. Within the City of Los Angeles, the approximate consumption was 455 mmcf/d. It is estimated that 303 mmcf/d was delivered for residential use in both single and multiple dwelling units, 116 mmcf/d was provided for power production and commercial purposes (HDR).

By the year 1990, the demand for natural gas within Southern California, based on an extrapolation of currently available figures (ARB, 1975) is expected to be about 5,450 mmcf/d. Of this, about 2,250 mmcf/d would be gas demand for electrical power generation. Assuming that by 1990 the gas companies can meet only half of the projected demand and that none of the gas they do supply is used for electrical power generation, the expected

Table IX-3. Trend projections in demand indicator elements for the City of Los Angeles.

INDICATOR ELEMENT	AVERAGE USAGE THRESHD.	TOTAL CENTRAL	TOTAL VALLEY	TOTAL WEST	TOTAL HARBOR	TOTAL CITY
POPULATION 1970 =		1,335,949	967,128	355,467	153,257	2,811,801
1990 =		1,357,773	1,160,679	389,329	170,331	3,078,112
ELECTRICITY						
1970	(15.6 kwh/cap/day)	20.8 GWHPD	15.1	5.5	2.4	43.9
1990	(26.0 kwh/cap/day)	35.3 GWHPD	30.2	10.1	4.4	80
GAS						
1970	(164 CFPCD)	219 Mill. CFPD	159	58.3	25.1	461
1990	(170 CFPCD)	231 Mill. CFPD	197	66.2	29.0	523
WATER						
1970	(182 GPCD)	223 Mill. GD	198	67.9	23.3	512
		(167 GPCD)	(205)	(191)	(152)	
1990	(170 GPCD)	220 Mill. GD	217	59.6	24.9	523
		(162 GPCD)	(187)	(153)	(146)	
SEWAGE						
1970	(126 GPCD)	180 MGD	112	41.2	20.7	354
		(135 GPCD)	(116)	(116)	(135)	
1990	(126 GPCD)	183 MGD	135	45.2	23.0	387
		(135 GPCD)	(116)	(116)	(135)	
SOLID WASTE						
1970	(8.1 PPCD)	5411 tons/day	3917	1440	621	11,388
1990	(10.2 PPCD)	6925 tons/day	5919	1985	869	15,698

domestic requirements (including population growth and an average consumption increase to 106 cubic feet per day per person) can be met and about 120 mmcf/d made available for industrial use in Los Angeles. This represents between 30 and 50 percent of the presently projected industrial requirements within the City limits. The City residential gas consumption rate of 332 mmcf/d for the year 1990 is shown in Table IX-3.

The total gas consumption projection for the City is estimated to be 523 mmcf/d in 1990 without any gas being used for electrical power production. This is equivalent to about a 4 percent increase over the 20 year period. It is estimated that the San Fernando Valley will experience a growth of 35,000 single family homes (16 percent increase) and 76,000 multi-family homes (83 percent increase) over the period 1970 to 1990 (SCAG '76). Central City and West City, on the other hand, will undergo a growth oriented solely toward multi-family dwellings. The projected combined increase is 144,000 for such units (a 41 percent increase), while the total number of single family residences of the two areas is projected to decline by 63,000 (18 percent decrease). Such trends will render the San Fernando Valley a relatively high consumer of natural gas on a per capita basis by 1990, assuming that residents of single family units will be continuing to use up to 20 percent more gas than members of multi-family units. Reduction of gas hookups to new residential construction could serve to further reduce the projected demand.

Energy will continue to be a potential constraint to development within the Los Angeles basin. Reduced supplies of natural gas combined with long-term increased demand for its competitor, electricity, will place pressure upon the utilities providing energy supplies. Increasing costs to acquire energy have traditionally been passed on to the residential user, and, should this trend continue and energy costs differentials between the City and alternative residential locations not be substantial, it is doubtul that energy availability will become the deciding criterion in residential locational decisions.

c. Water Availability. While total water demand is expected to rise to 523 MGPD by 1990, the average user consumption rate will decline to 170 CFPCD (7 percent decrease). One of the major reasons behind a declining consumption rate is the trend toward multi-family housing. SCAG-76 projects an addition of 244,562 multi-family units (54 percent increase) and a decline of 28,066 single family units (5 percent decrease) in the City of Los Angeles by 1990. There is a recognized need to conserve water resources in Los Angeles and this need will intensify over time as the population of Los Angeles, as well as other western water-starved cities, increases. Most residential conservation practices are estimated to occur in the San Fernando Valley and western city areas where consumption rates are highest. These two areas are typified by relatively large landscaped yards. While the western city area has a low single family to multi-family unit ratio, single family homes in the area are commonly associated with some of the largest landscaped yards in the city. Table IX-3 indicates a 20 percent drop in consumption for the west city region, 9 percent for the San Fernando Valley, 3 percent for the central city region, and 4 percent for Harbor. In reality these decreases would be represented by a slight decrease in demand in the central part of the city with the largest increase in demand occurring in the San Fernando Valley.

The 20 percent drop calculated for the west region is probably too high as the loss in single family homes will occur around West Los Angeles, Century City, Palms, and Mar Vista areas, and not in the Santa Monica Hills, where the greatest water usage rates occur. In fact, single family homes in the mountain portion of the west region are expected to increase in number. Therefore, the decrease in water consumption in 1990 in this region of the City may not be as great as projected.

The existing water resources crises and the need to recognize regional solutions should serve to stimulate long-range planning oriented toward meeting certain water needs through the reclamation of treated wastewater. The Facilities Plan recognizes this need and EPA, State, and City efforts have resulted in the serious development of alternative E-2, the maximum reclamation alternative, as a viable choice to meet facilities planning goals.

d. Wastewater Treatment. Additional growth in the City will increase demands for sewage disposal. Based on average per capita rates of 116 GPCD in the San Fernando Valley and West Los Angeles areas, and 135 GPCD in the Central and Harbor areas, an additional demand of 33 mgd is anticipated. The City's current method of using a 5-day, 5-week average to measure wastewater flow is consistent with 1974 census data which identified a daily net increase in employment within the City in excess of 150,000 persons. The City, as the regional core, employment center, and commercial center, effectively increases its population by an estimated 10 percent during the weekdays. This results in higher than average GPCD figures because the actual is measured against the resident population instead of being compared to the effective population. From Table IX-3, it can be seen that the largest increase in demand for a sewage disposal will occur in the San Fernando Valley.

The Facilities Plan is designed to meet such flow requirements. However, the lack of wastewater collection, interceptor, and/or treatment facilities could threaten public health and result in a curtailment of building activity and growth through the establishment of a moratorium. The requirement that, for public health reasons, wastewater disposal be available combined with the potential for pollution of groundwater through extensive use of private septic systems provide the local Health Department and the State Water Resources Control Board with reasons to curtail development should viable Facilities Plan alternatives not be adopted.

e. Solid Waste Disposal. Solid waste generation will increase with urban development creating a further demand for collection services, resource recovery facilities, and sanitary landfills. Additional growth could contribute as much as 4,310 tons per day of solid waste based upon a 8.1 pound per capita day average in 1975 and projected 10.2 pound per capita day average in 1990. This is the estimated total of residential, commercial, and some industrial and agricultural wastes that are now and/or will be deposited in sanitary landfills by 1990 (Envirogenics Systems, Col, 1973). From Table IX-2 it can be seen that again the largest increase in demand will occur in the San Fernando Valley (about 40 percent of the City total).

2. LAND USE PLANS AND PROJECTED CAPACITIES

a. Review of Applicable Plans and Policies. The role that land use plans and local governmental policies play in promoting and/or discouraging unplanned, environmentally unsound growth with resulting secondary impacts must be taken into consideration within the framework of the overall Facilities Planning process. Should local decisions work contrary to regional environmental quality, the responsible, larger scale governing body is required to counter those decisions to ensure superior environmental conditions. Whenever local decisions have demonstrated a recognition of the need for long-term enhancement of the environment through responsible development, the larger scale governing body may refrain from interfering with local policy.

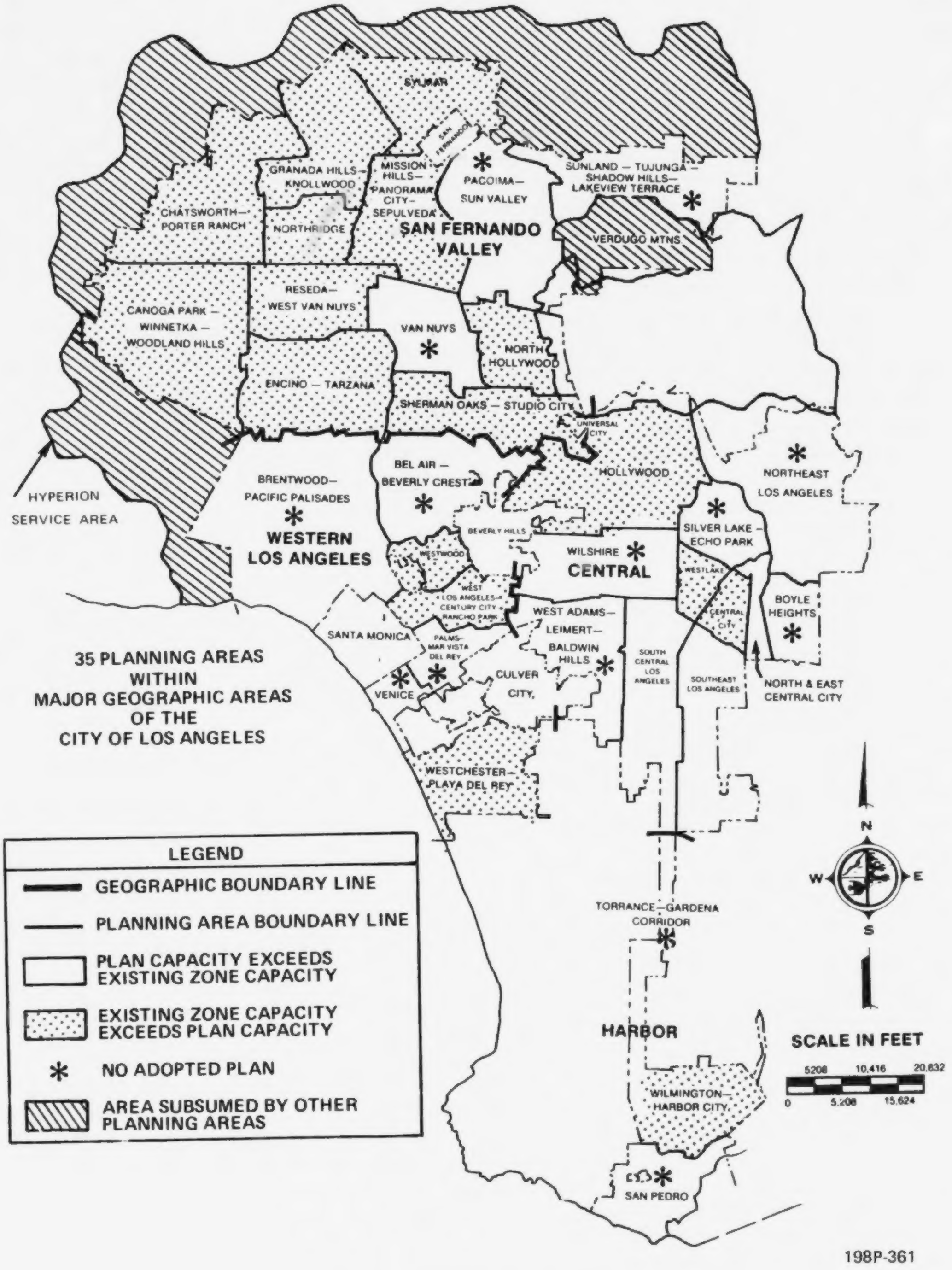
Plans and policies applicable to the Facilities Plan have been described in detail in Chapters II and IV. The plans and policies pertinent to land use are promulgated at three levels of government—state, regional, and local—resulting in fragmented and, oftentimes, contradictory goals and implementation techniques. Attempts are being made at the state and regional levels to integrate environmental objectives, such as air and water quality, into a more comprehensive land use planning effort. This integration is being spearheaded by federal programs such as the Areawide Wastewater Management Plan (208) and the Air Quality Maintenance Plan (AQMP) (see Section II.E).

Future land use planning for the wastewater facilities planning area is presently in various stages of development. The Air Quality Maintenance Plan and the Areawide Wastewater Management Plan are in the beginning phases; the Coastal Plan has been completed; the Los Angeles County River Basin Plan has been approved by the Regional Water Quality Control Board, and is near final adoption by the State Water Resources Control Board; the Concept Los Angeles and the Los Angeles Citywide Plan have been adopted, but the 35 community plans which establish actual land use policy for the city are in the various stages of preparation identified in Section II.E.2.

b. Existing and Projected Land Use Capacity. Figure IX-2 shows that most of the adopted plans in the Hyperion Service Area are in the San Fernando Valley. These adopted plans provide some indication of future land use in the Valley, although, as discussed above, do not result in definitive constraints.

Table IX-4 compares current zoning and land use to future land use as proposed in the adopted plans. In many cases, "Total Area" figures differ because current land use and zoning is based on the Land Use Planning and Management Systems (LUPAMS) file, and future land use is based on community plans; errors in the County Assessor's Secured Abstract File (ASF) upon which LUPAMS is based could account for much of the discrepancy (see Chapter II for a more thorough discussion of this problem). In interpreting the data, differences should therefore be compared by individual categories.

The land use plans which have been adopted to date indicate that increases in dwelling units are not only anticipated, but accommodated for in the San Fernando Valley. As Table IX-5 shows, the plans allow for a 42.5 percent increase in the number of dwelling units in the Valley; the communities in north and west Valley—Chatsworth-Porter Ranch, Canoga Park-Winnetka-Woodland Hills, Granada Hills-Knollwood, Northridge, and Sylmar—show a potential average increase of 68.6 percent, and the communities in the central and eastern Valley—Encino-Tarzana, Mission Hills-Panorama City-Sepulveda, North Hollywood, Reseda-West Van Nuys, Sherman Oaks-Studio City-Toluca Lake—show an average increase of 20.9 percent. The conclusion which can be drawn is that the adopted plans allow for substantial growth in the west Valley, thereby accommodating projected population trends as shown in Table IX-4, and do not act as a constraint as presently configured.


SYLMAR
SAN FERNANDO
GRANADA HILLS–KNOLLWOOD
MISSION HILLS–PANORAMA CITY–SEPULVEDA
PACOIMA–SUN VALLEY
SUNLAND – TUJUNGA – SHADOW HILLS–LAKEVIEW TERRACE
CHATSWORTH–PORTER RANCH
NORTHRIDGE
SAN FERNANDO VALLEY
VERDUGO MTNS
RESEDA–WEST VAN NUYS
CANOGA PARK – WINNETKA – WOODLAND HILLS
VAN NUYS
NORTH HOLLYWOOD
ENCINO – TARZANA
SHERMAN OAKS – STUDIO CITY
UNIVERSAL CITY
HYPERION SERVICE AREA
BRENTWOOD–PACIFIC PALISADES
BEL AIR – BEVERLY CREST
HOLLYWOOD
NORTHEAST LOS ANGELES
WESTERN LOS ANGELES
BEVERLY HILLS
WESTWOOD
SILVER LAKE – ECHO PARK
WILSHIRE CENTRAL
WESTLAKE
WEST LOS ANGELES–CENTURY CITY RANCHO PARK
BOYLE HEIGHTS
CENTRAL CITY
WEST ADAMS–LEIMERT–BALDWIN HILLS
SANTA MONICA
PALMS–MAR VISTA DEL REY
SOUTH CENTRAL LOS ANGELES
SOUTHEAST LOS ANGELES
NORTH & EAST CENTRAL CITY
VENICE
CULVER CITY,
35 PLANNING AREAS WITHIN MAJOR GEOGRAPHIC AREAS OF THE CITY OF LOS ANGELES
WESTCHESTER–PLAYA DEL REY
LEGEND
GEOGRAPHIC BOUNDARY LINE
PLANNING AREA BOUNDARY LINE
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WILMINGTON–HARBOR CITY
SAN PEDRO
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Figure IX-2. Status of community plans.

Table IX-4. Comparison of existing zoning and land use to future land use as expressed in adopted San Fernando Valley Community Plans.

PLAN AREA	SINGLE FAMILY DWELLINGS	MULTIPLE FAMILY DWELLINGS	COMMERCIAL	INDUSTRY	TOTAL PUBLIC & QUASI-PUBLIC	OPEN SPACE	MISC.	INVALID	TOTAL AREA
CHATSWORTH-PORTER RANCH									
Future Land Use in Acres	8,420	530	450	1,796	2,314	390	-	-	13,960
Percentage of Total Area	60.6%	3.8%	3.32%	12.9%	16.6%	2.8%	-	-	100%
Current Land Use in Acres	7,019.2	384.4	410.4	1,191.5	255.2	-	1,939.8	252	11,225.7(2)
Percentage of Total Area	62.5%	3.4%	3.7%	10.6%	2.3%	-	17.3%	.2%	100.%
Current Zoning in Acres	9,161.4	216	354.4	1,454.1	-	-	-	39.8	11,225.7(2)
Percentage of Total Area	81.6%	1.9%	3.2%	13.0%	-	-	-	.4%	100%
CANOGA PARK-WINNETKA-GRANADA HILLS									
Future Land Use in Acres	11,200	1,080	1,010	840	1,870	200		-	16,200
Percentage of Total Area	69%	7%	6%	5%	12%	1%		-	100%
Current Land Use in Acres	10,806.7	402.8	821.4	512.5	391.5	-		17.1	14,555
Percentage of Total Area	74.2%	2.8%	5.6%	3.5%	2.7%	-		.1%	100%
Current Zoning in Acres	12,668.1	478.5	784.8	550.0	-	-		73.8	14,555
Percentage of Total Area	87%	3.3%	5.4%	3.8%	-	-		.5%	100%
ENCINO-TARZANA									
Future Land Use in Acres	7,454	459	449	39	354	3,604	-	-	12,359
Percentage of Total Area	60.3%	3.7%	3.6%	0.3%	2.9%	29.2%	-	-	100%
Current Land Use in Acres	6,684.4	390.3%	301.9	17.2	502	-	2,903.4	29.0	10,825
Percentage of Total Area	61.7%	3.6%	2.8%	.2%	4.6%	-	26.8%	.3%	100%
Current Zoning in Acres	9,577.7	243.9	243.3	21.7	-	-	-	641.6	10,828
Percentage of Total Area	88.5%	2.3%	3.2%	.2%	-	-	-	5.9%	100%

Table IX-4. (Cont.)

PLAN AREA	SINGLE FAMILY DWELLINGS	MULTIPLE FAMILY DWELLINGS	COMMERCIAL	INDUSTRY	TOTAL PUBLIC & QUASI-PUBLIC	OPEN SPACE	MISC.	INVALID	TOTAL AREA
GRANADA HILLS-KNOLLWOOD									
Future Land Use in Acres	6,320	210	281	4	2,548	-	-	-	9,363
Percentage of Total Area	67.5%	2.2%	3%	.04%	27%	-	-	-	100%
Current Land Use in Acres	6,374.3	180.1	214.2	368.5	276.9	-	2,244.1	3.4	9,661.5
Percentage of Total Area	66%	1.9%	22%	3.8%	2.9%	-	23.2%	0	100%
Current Zoning in Acres	9,359.5	90.5	197.9	4.2	-	-	-	7.2	9,659.3
Percentage of Total Area	97.0%	.9%	2.0%	.04%	-	-	-	.07%	100%
MISSION HILLS-PANORAMA CITY-SEPULVEDA									
Future Land Use in Acres	4,472	795	601	305	965	-	-	-	7,138
Percentage of Total Area	62.7%	11.1%	8.4%	4.3%	13.5%	-	-	-	100%
Current Land Use in Acres	5,005.8	401.8	453.9	248.1	246	-	9,124	19.2	7,286.8
Percentage of Total Area	68.7%	5.5%	6.2%	3.4%	3.4%	-	12.8%	.3%	100%
Current Zoning in Acres	6,041.3	429.6	470.6	318.0	-	-	-	27.6	7,257.1
Percentage of Total Area	82.9%	5.9%	6.5%	4.4%	-	-	-	.4%	100%
NORTH HOLLYWOOD									
Future Land Use in Acres	3,119	1,705	483	456	815	87	24	-	6,689
Percentage of Total Area	47%	26%	7%	7%	12.2%	2%	0	-	100%
Current Land Use in Acres	2,594.3	845.9	504.9	322.2	145.4	-	514.8	5.5	4,933.3
Percentage of Total Area	52.6%	17.1%	10.2%	6.5%	2.9%	-	10.4%	-.1%	100%
Current Zoning in Acres	2,182.9	1,645.2	578.8	488.4	-	-	-	37.9	4,933.2
Percentage of Total Area	44.2%	33.3%	11.7%	9.9%	-	-	-	.8%	100%

Table IX-5. Comparison of adopted 1990 dwelling unit capacities to 1975 dwelling units in San Fernando Valley.

COMMUNITY PLANNING AREA	1975 DWELLING UNITS[1]	1990 DWELLING UNIT CAPACITIES[2]	INCREASE 1970 TO 1990	PERCENTAGE INCREASE
PLAN CAPACITY[3] EXCEEDS CURRENT ZONING CAPACITY				
Chatsworth-Porter Ranch	17,883	35,510	17,627	98.5%
Canoga Park-Winnetka-Woodland Hills	40,388	66,000	25,612	63.4%
Granada Hills-Knollwood	16,396	22,184	5,788	35.3%
Northridge	13,107	20,144	7,037	53.6%
Sylmar	11,327	21,755	10,428	92 %
EXISTING ZONING[3] EXCEEDS PLAN CAPACITY				
Encino-Tarzana	24,359	31,355	6,996	28.7%
Mission Hills-Panorama City-Sepulveda	33,599	38,116	4,517	13.4%
North Hollywood	38,440	56,229	17,789	46.2%
Reseda-West Van Nuys	27,017	35,628	8,611	31.8%
Sherman Oaks-Studio City-Toluca Lake	35,868	41,488	5,620	15.6%
ADOPTED PLANS TOTALS	258,384	368,409	110,025	42.5%

[1] Department of City Planning, City of Los Angeles, 1975.

[2] Individual Community Plans.

[3] See Table GS-26.

Future land use in the Terminal Island Service Area is much more difficult to assess from the ongoing community planning in the area. The San Pedro Community Plan is still under review, and the Wilmington-Harbor City Plan is 6 years out-of-date. However, projected land use for the service area can be based on planned developments trends. These planned and projected developments include a large landfill area (approximately 1,000 acres) in the existing Los Angeles Harbor to expand cargo transfer and storage capacity; more intensive use of industrially zoned land in the development of supertanker and container terminals and warehouses; a small craft recreational harbor at Cabrillo Beach in San Pedro; an increase in residential density in the northwest Wilmington and western San Pedro areas; an upgrading of the Wilmington and western San Pedro areas; and an upgrading of the commercial areas in San Pedro as a result of the Beacon Hills Redevelopment Project. These planned developments and/or trends indicate that little, if any, change will occur in present zoning (State of California Governor's Office of Planning and Research, 1976).

This background information on the plans and policies for controlling and channeling growth in the Los Angeles area describes the essential elements of the SCAG-76 growth scenario that have been used for facilities planned; and it discusses the elements of the General Plan and zoning as they relate to growth. Both the General Plan and existing zoning provide more than enough capacity to accommodate growth for Los Angeles by the SCAG-76 scenario.

Table IX-6 shows the total acreage in each of the Regional Statistical Areas (RSAs) used as basic planning areas by SCAG. In addition, the percentage of undeveloped land available in each RSA and projections of the numbers of acres to be urbanized from 1970 to 1990 are presented. The implications are clear that the trend toward urbanization is expected to be highest in the San Fernando Valley, as compared with the Coastal Plain. Figure IX-3 gives the geographic areas covered by the corresponding RSAs. Note that RSAs 12, 13, and 14 correspond to the San Fernando Valley, and the remainder approximately correspond to the Coastal Plain. In all, 34.7 percent of the total area under consideration lies in the San Fernando Valley, but it was estimated to contain 65.7 percent of the "available" acres in 1970. RSA No. 14, the Northeast San Fernando Valley, had almost 30 percent of the available land in 1970, the highest for the region, with RSA No. 12, the Southeast San Fernando Valley, second at 24.8 percent. Actual urbanization is expected to be highest in the Southwest San Fernando Valley, through conversion of 5,410 acres. In all, these developmental trends would result in the conversion of 7,654 acres to urban use in the San Fernando Valley, as compared with 3,006 acres for the Coastal Plain.

Table IX-6. Percentage of land available for development by RSA (1970) and projected acres developed, 1970-1990.

RSA NUMBER	RSA NAME	TOTAL ACRES	PERCENT AVAILABLE FOR DEVELOPMENT 1970	PROJECTED DEVELOPMENT ACRES 1970-1990
12	Southwest San Fernando Valley	87,484	24.8	5,410
13	Burbank	28,922	6.7	734
14	Northeast San Fernando Valley	53,456	29.9	1,510
Total	San Fernando Valley	169,862	23.3	7,654
16	Santa Monica	44,732	5.7	1,407
17	West Central	61,339	7.3	245
18	South Bay	42,376	5.0	381
19	Palos Verdes	60,450	15.6	544
21	East Central	61,910	2.9	225
23	Los Angeles CBD	3,852	0	0
24	Glendale	45,619	0.8	204
Total	Coastal Plain	320,258	6.5	3,006
Grand Total		490,120	12.3	10,660

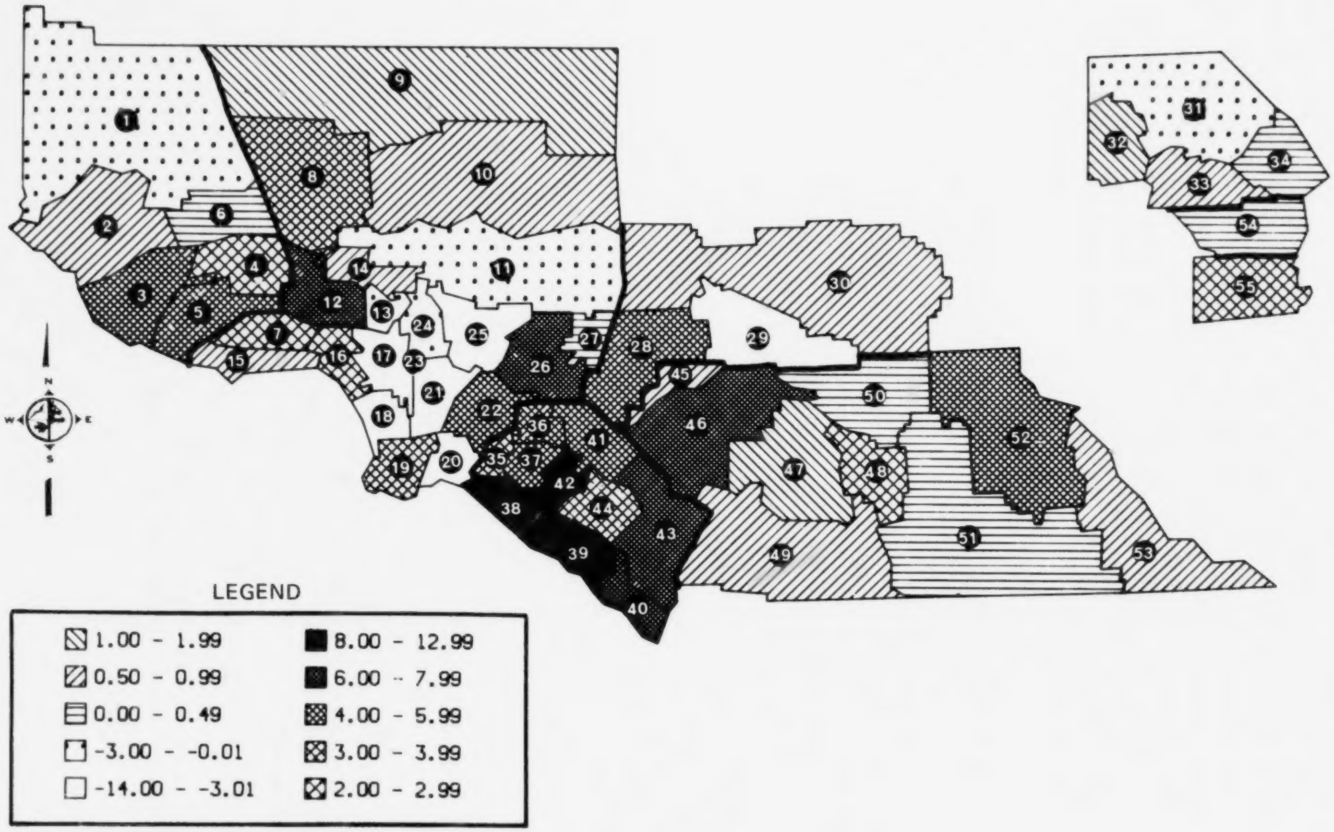
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Figure IX-3. Percent of regional population change, 1970-1974, by RSA.

In 1990, an estimated 54,189 acres of available developable land are projected to remain in the service area, a reduction of 10.2 percent from the 1970 value of 60,349 acres. Availability of developable land per se thus does not constitute a restriction to growth in the service area.

Table IX-7 shows the 1970 and projected 1980 and 1990 percentages of residential, commercial, and industrial land uses within the RSAs. No significant changes in the essential character of the RSAs are projected by SCAG, although modest increases in both commercial and industrial utilization of acreage are predicted for many areas, and the split between single-family and multiple-family dwelling units is not defined by these data.

Table IX-7. Past and projected land use by classification, percent.

		PERCENT								
RSA NO.	RSA NAME	RESIDENTIAL			COMMERCIAL			INDUSTRIAL		
		1970	1980	1990	1970	1980	1990	1970	1980	1990
12	SW San Fernando Valley	(76.0)	(74.9)	(74.3)	(5.8)	(6.1)	(6.1)	(4.9)	(5.6)	(6.0)
13	Burbank	(67.2)	(66.4)	(66.0)	(8.4)	(8.4)	(8.4)	(10.9)	(11.3)	(11.6)
14	NE San Fernando Valley	(70.1)	(66.9)	(69.7)	(3.6)	(3.7)	(3.7)	(3.2)	(3.6)	(3.8)
16	Santa Monica	(68.1)	(65.6)	(65.0)	(6.1)	(6.6)	(6.8)	(4.6)	(5.0)	(5.1)
17	West Central	(73.3)	(72.1)	(71.1)	(12.4)	(12.9)	(13.3)	(3.3)	(3.5)	(3.7)
18	South Bay	(57.5)	(56.2)	(55.5)	(6.7)	(7.1)	(7.3)	(12.1)	(13.4)	(14.2)
21	East Central	(51.7)	(51.7)	(51.5)	(7.5)	(7.5)	(7.4)	(24.2)	(24.2)	(24.1)
23	Los Angeles CBD	(33.4)	(33.5)	(33.7)	(33.0)	(33.1)	(33.3)	(14.8)	(14.7)	(14.0)
24	Glendale	(65.3)	(64.3)	(63.3)	(5.5)	(5.8)	(6.0)	(4.9)	(5.3)	(5.7)

In 1990, 21,195 available acres are projected to remain undeveloped in the Coastal Plain as the term has been used in this analysis of land availability and impact. This would be more than enough to accommodate the growth projected for the San Fernando Valley (7,654 acres) in the 1970-1990 period, if it were redirected to other portions of the Hyperion Service Area, as postulated in Alternative CX of the concentrated population postulated under Alternatives B4C, C3, or E2, with clustered growth.

The basic conclusion derived from this brief review of existing land use plans and zoning is that neither adopted plans nor zoning exists as a constraint to development in the planning period considered for the SCAG-76 population levels projected.

C. impacts of subsidiary alternatives

C. IMPACTS OF LOCATION AND GROWTH

1. WASTEWATER FACILITIES ALTERNATIVES AND POPULATION PROJECTIONS

The analysis of secondary impacts due to growth has been performed, using 10 km grid cells laid over the Los Angeles area. This gridwork of data incorporates information from 1,285 Traffic Analysis Zones covering the same area, and is designed to be consistent with future Air Quality Maintenance Plan studies. Figure IX-4 shows the 45 analysis zones superimposed on a base map, and compared with the actual Hyperion Service Area. Twelve zones have been defined as the Hyperion Service Areas with five representing the San Fernando Valley and seven, the Coastal Plain portions of the service area.

a. Baseline Growth Assumptions and Scenario. A baseline year, consistent with 1974 existing conditions, and a projected year, the SCAG-76 projections for 1990, were mapped to present a baseline year and the expected growth. Alternative growth and population distribution scenarios have been developed to analyze future population, land use, vehicle miles traveled (VMT), and air quality, to establish the impacts accommodated by the project. The relationship of these scenarios to the major EIS alternatives and the policies necessary for each scenario are presented in the scenario descriptions below. The model used in the projections is described in Appendix II-A.

SCENARIO 1. PLANNED GROWTH. Current facilities planning efforts are directed toward accommodating SCAG-76 population totals and distribution. This scenario is the SCAG-76 projection with an approximate total of 6 percent growth in the service area for the period 1975 through 1990. Some growth will occur in all areas of the City, but the West Valley will receive the greatest increase—a total of 22 percent above estimated 1974 levels. This growth scenario is consistent with the viable alternatives, including Inland/Coastal Split (Alternative B4C), Coastal with AVORS (Alternative C3), and Maximum Reclamation (Alternative E2).

b. Alternative Growth Scenarios. The following scenarios were prepared and processed to determine the relative impact of alternative Facilities Plan possibilities.

SCENARIO 2. VALLEY GROWTH DISPLACED TO THE SOUTHERN HALF OF THE CITY. This scenario is that projected under Alternative CX. The SCAG-76

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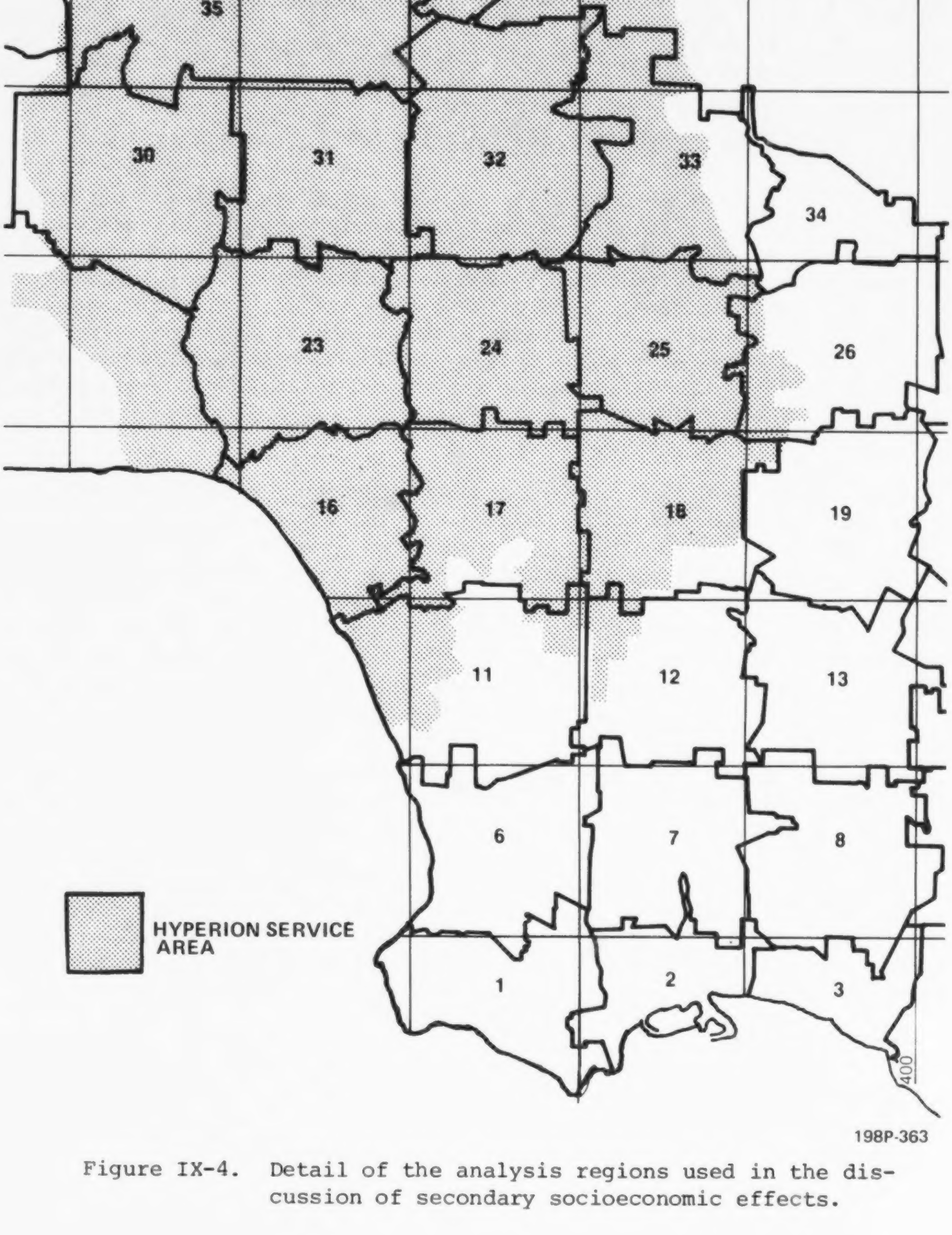
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Figure IX-4. Detail of the analysis regions used in the discussion of secondary socioeconomic effects.

growth totals are reallocated so that no growth occurs within the San Fernando Valley, and all growth that would have located in the Valley is allocated within the Hyperion Service Area, south of the mountains. This scenario would involve policy decisions that include failure of the mitigation strategies for minimizing secondary air quality impacts, failure to institute maximum reclamation, construction of SCAG-76 capacity requirements at Hyperion only, and no Valley hydraulic relief.

SCENARIO 3. NO SERVICE AREA GROWTH. This scenario projects the emissions and air quality in the Hyperion Service Area if no growth were to occur in the service area. For 1990, emissions are reduced, and air quality is improved because of the ongoing air improvement efforts (e.g., pollution control devices on cars). This scenario is used as a No Project comparison to investigate the impacts of the growth accommodated by the Facilities Plan, Alternatives B4C, C3, and E2. No Project is not proposed as an actual alternative for possible implementation. The no service area growth scenario is examined with the assumption that there will also be no growth in the SCAB as a whole.

c. Assumptions Used to Evaluate Scenarios. To evaluate the regional effect of specific scenarios, the 1990 populations were reallocated. Population, housing, and employment were distributed to the Los Angeles region as an estimated result of no hydraulic relief to the San Fernando Valley. Assumptions used for the reallocation include:

- For each allocation, it was assumed that 81.7 percent of the growth that would have occurred in the Valley would be redirected to 10 km grid areas proportionate to their 1990 population projections. It was assumed that housing units, retail employment, and total employment would also be proportionate to the 1990 area share.
- For each allocation for growth outside of Los Angeles County, it was assumed that 18.3 percent of the growth that would have occurred in the San Fernando Valley would be redistributed to Southern California counties proportional to the size of the net outmigration streams from Los Angeles County to each of these counties between 1970 and 1973, as estimated from Table IX-8 (Berg and Van Arsdol, 1975).
- For housing and employment outside the County, it was assumed that reallocated populations would require jobs and housing in the same proportion as found for Los Angeles County in the SCAG-90 projection. Single family and multiple family housing units were independently allocated. Retail, nonretail, and total employment were allocated by the same method. Thus, population/housing and population/employment ratios were calculated for the Los Angeles County total, for 1990, and housing and employment were allocated by SCAG County Statistical Areas and to Southern California counties on the basis of these ratios.

Table IX-8. Migratory paths exceeding an annual gross volume of 3,000 licenses between northern, southern, and southern and northern counties, California, 1970-1973.

MIGRATORY PATHS	STREAM[1]	COUNTER-[2] STREAM	GROSS[3] "MIGRATION"	NET[4] "MIGRATION"	EFFICIENCY[5]
Between Northern Counties					
Alameda to Contra Costa	7,502	5,474	12,976	2,028	15.6
San Francisco to San Mateo	8,727	3,791	12,518	4,936	39.4
San Mateo to Santa Clara	8,173	4,326	12,499	3,847	30.8
Alameda to Santa Clara	4,013	3,192	7,205	821	11.4
San Francisco to Alameda	3,845	2,556	6,401	1,289	20.1
San Francisco to Maria	3,784	1,528	5,316	2,260	42.5
Santa Clara to Santa Cruz	2,706	1,254	3,960	1,452	36.7
San Francisco to Santa Clara	2,276	1,555	3,831	721	18.8
San Mateo to Alameda	2,242	1,468	3,710	774	20.9
Placer to Sacramento	1,897	1,327	3,224	570	17.7
Yolo to Sacramento	1,669	1,554	3,223	115	3.6
Between Southern Counties					
Los Angeles to Orange	48,726	18,681	67,407	30,045	44.6
Los Angeles to San Diego	14,834	7,272	22,106	7,562	34.2
Los Angeles to San Bernardino	12,668	7,591	20,259	5,077	25.1
Los Angeles to Ventura	10,814	5,104	15,918	5,710	35.9
Los Angeles to Riverside	8,833	3,654	12,537	5,229	41.7
Orange to San Diego	4,523	3,337	7,860	1,186	15.1
San Bernardino to Riverside	3,711	3,337	7,048	374	5.3
Los Angeles to Santa Barbara	3,954	2,453	6,407	1,501	23.4
Orange to Riverside	3,918	2,295	6,213	1,623	26.1
Los Angeles to Kern	3,201	2,282	5,483	919	16.8
Orange to San Bernardino	2,386	2,501	4,887	115	2.4
San Bernardino to San Diego	2,151	1,317	3,468	834	24.0
Riverside to San Diego	1,781	1,423	3,204	358	11.2
Between Southern and Northern Counties					
Los Angeles to Santa Clara	5,210	3,313	8,523	1,897	22.3
Los Angeles to Alameda	4,374	3,170	7,544	1,204	16.0
Los Angeles to San Francisco	3,193	2,580	5,773	613	10.6
Los Angeles to Sacramento	2,792	1,923	4,715	869	18.4
Los Angeles to San Mateo	2,189	1,763	3,952	426	10.8
Los Angeles to Contra Costa	2,312	1,467	3,779	845	22.4
Los Angeles to Fresno	1,850	1,367	3,217	483	15.0

[1] The number of licenses from county i surrendered in county j.

[2] The number of licenses from county j surrendered in county i.

[3] (Stream) + (Counterstream).

[4] (Stream) - (Counterstream).

[5] (Net Migration/Gross Migration).

SOURCE: Berg and Van Arsdol, 1975.

- All allocations between 1976 and 1990 are based on linear changes. Thus, if it is desired to allocate to 1990 on the basis of a San Fernando Valley area growth cutoff subsequent to 1976, a linear interpolation is appropriate.

The estimate of the population made here is based on a study by Roof (1975). Roof used a components of growth approach to estimate the 1974 population of Los Angeles County. Each growth component (birth, death, net migration) was estimated separately.

2. SOCIOECONOMIC IMPLICATIONS OF ALTERNATIVE GROWTH SCENARIOS

a. **Introduction**. This section addresses secondary socioeconomic impacts potentially resulting from the three scenarios (additional scenarios are discussed in the mitigation section of this report). Socioeconomic variables included are population, housing, residential land requirements, education, electrical energy, natural gas, water, wastewater, health, recreation, and public safety. The emphasis is on requirements for these services in the twelve analysis zones defined as representing the Hyperion Service Area (see Figure IX-4). The three growth scenarios are:

- Growth as anticipated by SCAG-76 (the B4C, C3, and E2 alternatives)
- Service Area Growth as anticipated by SCAG-76, but with the San Fernando Valley portion of that growth redistributed to the coastal portion of the service area (the CX alternative)
- No Growth in SCAB, including the Hyperion Service Area

Estimates of the growth level of services required in each of the analysis zones for project alternatives are presented. Because the methodology of the population redistributions was intended as an approximation of wastewater systems needs and resultant air quality effects, the assessment of secondary socioeconomic services in this section is a generalized approach. No attempt is made to analyze neighborhood distribution systems, for example, but a generalized statement of where what services would be required is provided. To estimate these services, the basic input data are area population, and number of single family and multi-family dwelling units required in each area as developed from the SCAG-76 projection. To estimate the land requirements to house these people, it was assumed that single family dwelling units would require an average of 4 units per gross residential acre while multi-family dwelling units were computed at an average of 20 units per gross residential acre. Since the areas under analysis are large (10 kilometer squares) and a variety of both multiple and single family housing types are likely to be found in any given district, these generalized factors will estimate, with a reasonable degree of precision, the land requirements for housing.

Educational requirements were based on factors supplied by the City Department of Planning (Department of City Planning, 1975). It was assumed that an average single family dwelling unit would produce 0.7 elementary students, 0.3 junior high school students, and 0.25 senior high school students. Multiple family dwelling units would provide 0.05 elementary students, 0.03 junior high school students, and 0.03 senior high school students. Regional classroom requirements were then estimated by assuming 30 elementary school students would be housed in each classroom, while one classroom would be required for each 35 junior high school students and for each 35 senior high school students. Since Los Angeles may implement regional school integration in the near future, a student's place of residence is not necessarily related to the region in which he will be schooled. However, for the general purposes of this analysis, it is sufficient to estimate the total number of students and classrooms that will be required in each analysis area. The 1970 and 1990 per capita requirements for electricity, natural gas, water, wastewater, and solid waste have been estimated above, and are summarized in Table IX-9. The values presented are the citywide per capita use factors. Since the use of regional factors that are available in some cases would tend to obfuscate the analysis, it is noted that the per capita use figures may fluctuate from the factors used in the table. For example, the current critical water shortage in Northern California has forced Southern California to institute limited water conservation measures. These measures may permanently alter the water use habits of Southern California, but this is not anticipated. A more likely event is a short-term deviation in the demand curve. Natural gas is a commodity in limited supply nationally, but California may experience a surplus of natural gas, at least in the short run (to 1990), due to the importation of Alaskan natural gas. Thus, the factors are not presented as absolute projections of the future realities, but are generalized estimates of the demand the public may place upon these public services in future years.

Table IX-9. Per capita service requirements in the greater Los Angeles area.

SERVICE (PER CAPITA DEMAND)	1970	1990
Electricity (kWh)	15.6	26.0
Natural Gas (cf)	164	170
Water (gal)	182	170
Wastewater (gal)	126	126
Solid Waste (lbs)	8.1	10.2

Proposed new national standards for hospital beds require one bed for every 440 residents of a community, and this factor has been used for computation of health facilities requirements. Requirements for medical practitioners have not been estimated, since these are highly individualized and are related to characteristics of localized population. In a city the size of Los Angeles, sufficient health care practitioners are available, although neighborhood deficiencies and surpluses may exist.

Recreational needs have been computed in terms of gross residential acres for neighborhood and community recreation areas by use of the City's factor of 2 acres per one thousand people. The current experience in Los Angeles, in terms of fires, fire fighters, major crimes, and police officers, has been used to estimate the future needs for these services in Los Angeles. Specific factors are 3.45 fires, 1.06 fire fighters, .099 major felonies, and 2.6 police officers per thousand people annually in each of the regions of Los Angeles. Public officials in charge of these personnel will allocate them to local areas dependent on the variety of the criteria other than just the number of people involved, but these factors will serve to provide the generalized overall estimated requirements.

b. Scenario 1: SCAG-76 Planned Growth. Facilities Plan Alternatives B4C, C3, and E2 have planned for regional growth to almost 3.5 million people at an annual growth rate of 0.4 percent, a very slow rate of change in an area which has traditionally experienced very rapid growth patterns (Table IX-10). Only one of the twelve analysis zones is projected to grow at a rate faster than 1 percent a year. The west portion of the valley (analysis zone 30) is expected to grow at a rate of approximately 1.3 percent per year over the study time period. To the immediate south of analysis zone 30 is the second most rapidly growing area—analysis zone 23, the mountain west area—but the annual rate of growth in zone 23 is about 0.6 percent per year, about half that in zone 30. While all areas are expected to grow, the differential rate of growth will result in a relative decline of population in some areas. This is particularly true in analysis zone 11, located on the southernmost portion of the coastal plain (near the airport) within the Hyperion Service Area. The third slowest growing area of the City is also located in the coastal plain toward the central section, analysis zone 17. In the San Fernando Valley, a fairly low rate of growth is anticipated in analysis zone 33, the eastern portion of the valley, where an annual growth rate of only about 0.2 percent per year has been projected.

Increased population of approximately 230,000 people over No Service Area Growth will result in some additional facilities and service requirements (Table IX-11). In particular, approximately 142,000 additional multiple family dwelling units and 14,000 additional single family dwelling units are anticipated in the area. Regions south of the Santa Monica Mountains are expected to undergo some recycling of land as all of the analysis zones south of the mountains with the exception of zone 23 are

Table IX-10. Service and facilities requirements in Los Angeles analysis areas under the SCAG-76 Growth scenario, 1990.

FACTOR	ZONE												
	11	16	17	18	23	24	25	30	31	32	33	35	TOTAL
Population (thousands)	379	342	432	422	110	293	313	312	281	247	137	227	3495
Single-family Units (thousands)	84	50	73	55	27	43	58	70	59	58	38	55	670
Multi-family Units (thousands)	76	115	119	137	21	119	90	40	55	42	14	12	840
Acres Req. —Single-family	21000	12500	18250	13750	6750	10750	14500	17500	14750	14500	9500	13750	167500
Acres Req. —Multi-family	3800	5750	5950	6850	1050	5950	4500	2000	2750	2100	700	600	42000
Acres Req. —Total	24800	18250	24200	20600	7800	16700	19000	19500	17500	16600	10200	14350	209500
Elem. Pupils	62600	40750	57050	45350	19950	36050	45100	51000	44050	42700	27300	39100	511000
Elem. Classrooms	2087	1358	1902	1512	665	1202	1503	1700	1468	1423	910	1303	17033
Jr. High Pupils	27480	18450	25470	20610	8730	16470	20100	22200	19350	18660	11820	16860	226200
Jr. High Classrooms	785	527	728	589	249	471	574	634	553	533	338	482	6463
Sr. High Pupils	23280	15950	21820	17860	7380	14320	17200	18700	16400	15760	9920	14110	192700
Sr. High Classrooms	665	456	623	510	211	409	491	534	469	450	283	403	5506
Electricity in MWHD	9.85	8.89	11.23	10.97	2.86	7.62	8.14	8.11	7.31	6.42	3.56	5.90	90.87
Natural Gas in MCFD	64.43	58.14	73.44	71.74	18.70	49.81	53.21	53.04	47.77	41.99	23.29	38.59	594.15
Water in MGD	64.43	58.14	73.44	71.74	18.70	49.81	53.21	53.04	47.77	41.99	23.29	38.59	594.15
Wastewater in MGD	47.75	43.09	54.43	53.17	13.86	36.92	39.44	39.31	35.41	31.12	17.26	28.60	440.37
Solid Waste in KTD	1933	1744	2203	2152	561	1494	1596	1591	1433	1260	699	1158	17825
Hospital Beds	861	777	982	959	250	666	711	709	639	561	311	516	7943
Recreation Area, Acre	758	684	864	844	220	586	626	624	562	494	274	454	6990
Fires	1308	1180	1490	1456	380	1011	1080	1076	969	852	473	783	12058
Firefighters	402	363	458	447	117	311	332	331	298	262	145	241	3705
Policepersons	985	889	1123	1097	286	762	814	811	731	642	356	590	9087
Felonies	38	34	43	42	11	29	31	31	28	24	14	22	346

Table IX-11. Differences in services and facilities requirements for No Growth and SCAG-76 scenarios.

FACTOR	ZONE												
	11	16	17	18	23	24	25	30	31	32	33	35	TOTAL
Population (thousands)	8	22	15	27	10	25	16	57	13	11	5	20	229
Single-family Units (thousands)	-2	-2	-8	-7	5	-2	-6	15	6	3	4	8	14
Multi-family Units (thousands)	18	15	24	26	0	18	19	11	4	8	0	-1	142
Acres Req.—Single-family	-500	-500	-2000	-1750	1250	-500	-1500	3750	1500	750	1000	2000	3500
Acres Req.—Multi-family	900	750	1200	1300	0	900	950	550	200	400	0	-50	7100
Acres Req.—Total	400	250	-800	-450	1250	400	-550	4300	1700	1150	1000	1950	10600
Elem. Pupils	-500	-650	-4400	-3600	3500	-500	-3250	11050	4400	2500	2300	5550	16900
Elem. Classrooms	-17	-22	-147	-120	117	-17	-108	368	147	83	93	185	563
Jr. High Pupils	-60	-150	-1680	-1320	1500	-60	-1230	4830	1920	1140	1200	2370	8460
Jr. High Classrooms	-2	-4	-48	-38	43	-2	-35	138	55	33	34	68	242
Sr. High Pupils	40	-50	-1280	-970	1250	40	-930	4080	1620	990	1000	1970	7760
Sr. High Classrooms	1	-1	-37	-28	36	1	-27	117	46	28	29	56	222
Electricity in MWHD	0.21	0.57	0.39	0.70	0.26	0.65	0.42	1.48	0.34	0.29	0.13	0.52	5.95
Natural Gas in MCFD	1.36	3.74	2.55	4.59	1.70	4.25	2.72	9.69	2.21	1.87	0.85	3.40	38.93
Water in MGD	1.36	3.74	2.55	4.59	1.70	4.25	2.72	9.69	2.21	1.87	0.85	3.40	38.93
Wastewater in MGD	1.01	2.77	1.89	3.40	1.26	3.15	2.02	7.18	1.64	1.39	0.63	2.52	28.85
Solid Waste in KTD	41	112	77	138	51	128	82	291	66	56	26	102	1168
Hospital Beds	18	50	34	61	23	57	36	130	30	25	11	45	520
Recreation Area, Acre	16	44	30	54	20	50	32	114	26	22	10	40	458
Fires	28	76	52	93	35	86	55	197	45	38	17	69	790
Firefighters	8	23	16	29	11	27	17	60	14	12	5	21	243
Policepersons	21	57	39	70	26	65	42	148	34	29	13	52	595
Felonies	1	2	1	3	1	2	2	6	1	1	0	2	23

expected to experience a net decline in the number of single family housing units offset by growth in the number of multiple family units. In most areas of the valley, single family construction is expected to exceed multiple family units added to the supply. In the Coastal Plain, recycling of land will result in a net reduction of residential land requirements in some areas and small increases in others. Only one area, zone 23 in the western portion of the Santa Monica Mountains, will require over 1,000 additional residential acres. In the Valley, all areas will require at least 1,000 additional residential acres, primarily due to the single family emphasis of the area's new construction: In the western portion of the Valley, zone 30, over 4,000 additional residential acres are expected to be required. As noted in the agricultural lands discussion, much of the limited remaining agricultural land of the City is in this area, and it is logical to assume that this land will be included in the new development. If this population growth should occur, approximately 17,000 more elementary school age children and 16,000 junior and senior high school age children will exist than are currently found in the school system. These students will require about 1,000 additional classrooms within the region. The declining birth rates and redistribution of students for integration may eliminate this particular facility need.

Additional daily needs have been estimated as:

Electricity	6 MkWh
Natural Gas	39 MCF
Water	39 MGD
Wastewater	29 MGD
Solid Waste	1,200 tons

Approximately 450 additional recreational areas in community and neighborhood centers will also be required, and the increased population will likely result in some increase in the incident of both fires and felonies, thus resulting in some increases in needs for firemen and policemen. Roughly 250 additional firemen and 600 additional policemen may be required to meet citywide requirements.

c. Scenario 2: Valley Growth Displaced to the Southern Half of the City. If growth were not possible in the San Fernando Valley, and this population instead located in the coastal plain and mountain areas serviced directly by the Hyperion Facility (Alternative CX), the rate of growth in the Valley would be zero, but since the citywide growth rate would continue at 0.4 percent a year, large differences might occur in the other areas of the City (Table IX-12). The largest change would likely occur in the westernmost mountain area (analysis zone 23) which is currently the lowest density area in the City, and is anticipated

Table IX-12. Service and facilities requirements in Los Angeles analysis areas under the Displaced Valley Growth scenario, 1990.

FACTOR	ZONE												
	11	16	17	18	23	24	25	30	31	32	33	35	TOTAL
Population (thousands)	416	345	447	433	126	303	327	255	268	236	132	207	3495
Single-family Units (thousands)	92	55	80	60	29	47	63	55	53	55	34	47	670
Multi-family Units (thousands)	79	119	123	141	22	123	93	29	51	34	14	12	840
Acres Req.—Single-family	23000	13750	20000	15000	7250	11750	15750	13750	13250	13750	8500	11750	167500
Acres Req.—Multi-family	3950	5950	6150	7050	1100	6150	4650	1450	2550	1700	700	600	42000
Acres Req.—Total	26950	19700	26150	22050	8350	17900	20400	15200	15800	15450	9200	12350	209500
Elem. Pupils	68350	44450	62150	49050	21400	39050	48750	39950	39650	40200	24500	33500	511000
Elem. Classrooms	2278	1482	2072	1635	713	1302	1625	1332	1322	1340	817	1117	17033
Jr. High Pupils	29970	20070	27690	22230	9360	17790	21690	17370	17430	17520	10620	14460	226200
Jr. High Classrooms	856	573	791	635	267	508	620	496	498	501	303	413	6463
Sr. High Pupils	25370	17320	23690	19230	7910	15440	18540	14620	14780	14770	8920	12110	192700
Sr. High Classrooms	725	495	677	549	226	441	530	418	422	422	255	346	5506
Electricity in MWHD	10.82	8.97	11.62	11.26	3.28	7.88	8.50	6.63	6.97	6.14	3.43	5.38	90.87
Natural Gas in MCFD	70.72	58.65	75.99	73.61	21.42	51.51	55.59	43.35	45.56	40.12	22.44	35.19	594.15
Water in MGD	70.72	58.65	75.99	73.61	21.42	51.51	55.59	43.35	45.56	40.12	22.44	35.19	594.15
Wastewater in MGD	52.42	43.47	56.32	54.56	15.88	38.17	41.20	32.13	33.77	29.74	16.63	26.08	440.37
Solid Waste in KTD	2122	1760	2280	2208	643	1545	1668	1301	1367	1204	673	1056	17825
Hospital Beds	945	784	1016	984	286	689	743	580	609	536	300	470	7943
Recreation Area, Acre	832	690	894	866	252	606	654	510	536	472	264	414	6990
Fires	1435	1190	1542	1494	435	1045	1128	880	925	814	455	714	12058
Firefighter	441	366	474	459	134	321	347	270	284	250	140	219	3705
Policepersons	1082	897	1162	1126	328	788	850	663	697	614	343	538	9087
Felonies	41	34	44	43	12	30	32	25	27	23	13	20	346

to grow at the second highest rate under the SCAG-76 projections (0.6 percent a year). The displacement of Valley growth to the areas south of the mountains would likely result in this region, increasing to an annual rate of growth of approximately 1.5 percent per year as 26,000 additional people move into the planning area. Another large increase in the rate of growth may occur in the south coastal plains analysis area (zone 11) which is anticipated by SCAG planners to be the slowest growing region of the City (0.1 percent a year) where the increase may be to a rate as high as 0.7 percent a year.

As shown in Table IX-13, service requirements differences between the Displaced Valley Growth scenario and SCAG-76 are all negative. Service requirements in the Mountains and Coastal Plain shown in Table IX-14 are in addition to the SCAG-76 increases shown on Table IX-11. The net effect citywide is for no change but the location of service needs would shift toward the non-Valley portion of the City.

d. Scenario 3: No Service Area Growth and No SCAB Growth. This scenario projects the emissions and air quality in the Hyperion Service Area and in SCAB if no growth were to occur. For 1990, emissions are reduced, and air quality is improved because of the ongoing air improvement efforts (e.g., pollution control devices on cars). This scenario is used as a No Project comparison to investigate the impacts of the growth accommodated by the Facilities Plan Alternatives B4C, C3, and E2. No Project (A1) is not proposed as an actual alternative for possible implementation.

Because some service requirements are declining, there would be some changes in the need for various services (see Table IX-9). The total population of the region would be approximately 3.3 million persons, and the areas of highest population concentration would occur in the general region known as the Wilshire Corridor (analysis zones 17 and 18). Together, these two zones have a current population of over 800,000 people. In the Valley portion of the City, the most populous area currently is the area around the Sepulveda Flood Plain (analysis zone 31). Population concentration throughout the Valley area has fewer people than all but one of the analysis zones of the Coastal Plain. About 48 percent of the City's overall housing stock is single family, but the analysis zones located in the Valley show much higher concentration of single family housing. Particularly the East Central zone (zone 33) and the North zone (zone 35) contain 70 to 80 percent single family housing units, and no area of the Valley falls below at least 50 percent single family housing. Alternatively, in both the mountain area (analysis areas 23, 24, and 25) and on the Coastal Plain (analysis areas 11, 16, 17, and 18), multiple family housing is the dominant type, and only one zone in each grouping contains a majority of single family housing units (zones 11 and 23, respectively).

Each 10 km x 10 km square would contain 24,700 acres. Two analysis zones are shown, requiring this much land or more just for residential uses. Zone 11, the Southern Coastal Plain area is actually larger

Table IX-13. Differences in services and facilities requirements for SCAG-76 and Displaced Valley Growth.

FACTOR	ZONE												
	11	16	17	18	23	24	25	30	31	32	33	35	TOTAL
Population (thousands)	37	3	15	11	16	10	14	-57	-13	-11	-5	-20	0
Single-family Units (thousands)	8	5	7	5	2	4	5	-15	-6	-3	-4	-8	0
Multi-family Units (thousands)	3	4	4	4	1	4	3	-11	-4	-8	0	0	0
Acres Req.—Single-family	2000	1250	1750	1250	500	1000	1250	-3750	-1500	-750	-1000	-2000	0
Acres Req.—Multi-family	150	200	200	200	50	200	150	-550	-200	-400	0	0	0
Acres Req.—Total	2150	1450	1950	1450	550	1200	1400	-4300	-1700	-1150	-1000	-2000	0
Elem. Pupils	5750	3700	5100	3700	1450	3000	3650	-11050	-4400	-2500	-2800	-5600	0
Elem. Classrooms	192	123	170	123	48	100	122	-368	-147	-83	-93	-187	0
Jr. High Pupils	2490	1620	2220	1620	630	1320	1590	-4830	-1920	-1140	-1200	-2400	0
Jr. High Classrooms	71	46	63	46	18	38	45	-138	-55	-33	-34	-69	0
Sr. High Pupils	2090	1370	1870	1370	530	1120	1340	-4080	-1620	-990	-1000	-2000	0
Sr. High Classrooms	60	39	53	39	15	32	38	-117	-46	-28	-29	-57	-0
Electricity in MWHD	0.96	0.08	0.39	0.29	0.42	0.26	0.36	-1.48	-0.34	-0.29	-0.13	-0.52	0.00
Natural Gas in MCFD	6.29	0.51	2.55	1.87	2.72	1.70	2.38	-9.69	-2.21	-1.87	-0.85	-3.40	0.00
Water in MGD	6.29	0.51	2.55	1.87	2.72	1.70	2.38	-9.69	-2.21	-1.87	-0.85	-3.40	0.00
Wastewater in MGD	4.66	0.38	1.89	1.39	2.02	1.26	1.76	-7.18	-1.64	-1.39	-0.63	-2.52	0.00
Solid Waste in KTD	189	15	77	56	82	51	71	-291	-66	-56	-26	-102	0
Hospital Beds	84	7	34	25	36	23	32	-130	-30	-25	-11	-45	0
Recreation Area, Acre	74	6	30	22	32	20	28	-114	-26	-22	-10	-40	0
Fires	128	10	52	38	55	35	48	-197	-45	-38	-17	-69	0
Firefighters	39	3	16	12	17	11	15	-60	-14	-12	-5	-21	0
Policepersons	96	8	39	29	42	26	36	-148	-34	-29	-13	-52	0
Felonies	4	0	1	1	2	1	1	-6	-1	-1	-0	-2	0

Table IX-14. Service and facilities requirements in Los Angeles analysis areas under the No Growth scenario, 1990.

FACTOR	ZONE												
	11	16	17	18	23	24	25	30	31	32	33	35	TOTAL
Population (thousands)	371	320	417	395	100	268	297	255	268	236	132	207	3266
Single-family Units (thousands)	86	52	81	62	22	45	64	55	53	55	34	47	656
Multi-family Units (thousands)	58	100	95	111	21	101	71	29	51	34	14	13	698
Acres Req.—Single-family	21500	13000	20250	15500	5500	11250	16000	13750	13250	13750	8500	11750	164000
Acres Req.—Multi-family	2900	5000	4750	5550	1050	5050	3550	1450	2550	1700	700	650	34900
Acres Req.—Total	24400	18000	25000	21050	6550	16300	19550	15200	15800	15450	9200	12400	198900
Elem. Pupils	63100	41400	61450	48950	16450	36550	48350	39950	39650	40200	24500	33550	494100
Elem. Classrooms	2103	1380	2048	1632	548	1218	1612	1332	1322	1340	817	1118	16470
Jr. High Pupils	27540	18600	27150	21930	7230	16530	21330	17370	17430	17520	10620	14490	217740
Jr. High Classrooms	787	531	776	627	207	472	609	496	498	501	303	414	6221
Sr. High Pupils	23240	16000	23100	18830	6130	14280	18130	14620	14780	14770	8920	12140	184940
Sr. High Classrooms	664	457	660	538	175	408	518	418	422	422	255	347	5284
Electricity in MWHD	9.65	8.32	10.84	10.27	2.60	6.97	7.72	6.63	6.97	6.14	3.43	5.38	84.92
Natural Gas in MCFD	63.07	54.40	70.89	67.15	17.00	45.56	50.49	43.35	45.56	40.12	22.44	35.19	555.22
Water in MGD	63.07	54.40	70.89	67.15	17.00	45.56	50.49	43.35	45.56	40.12	22.44	35.19	555.22
Wastewater in MGD	46.75	40.32	52.54	49.77	12.60	33.77	37.42	32.13	33.77	29.74	16.63	26.08	411.52
Solid Waste in KTD	1892	1632	2127	2015	510	1367	1515	1301	1367	1204	673	1056	16657
Hospital Beds	843	727	948	898	227	609	675	580	609	536	300	470	7423
Recreation Area, Acre	742	640	834	790	200	536	594	510	536	472	264	414	6532
Fires	1280	1104	1439	1363	345	925	1025	880	925	814	455	714	11268
Firefighters	393	339	442	419	106	284	315	270	284	250	140	219	3462
Policepersons	965	832	1084	1027	260	697	772	663	697	614	343	538	8492
Felonies	37	32	41	39	10	27	29	25	27	23	13	20	323

than this average, but the presence of large land consumptive developments such as Los Angeles International Airport means that average residential units require less land than the regional factors employed in this section would indicate. Zone 17, the Central Coastal area, also has higher densities than the average, as well as significant nonresidential development.

By 1990, the City of Los Angeles service area will have approximately a half-million elementary school children requiring about 16,000 classrooms citywide. Combined junior high and high school students will total approximately another 400,000 students, and will require roughly an additional 11,000 classrooms. Daily electrical requirements will be approximately 85 million kilowatt hours, and natural gas needs will be about 550 million cubic feet a day. Water needs have been estimated at approximately 550 MGD although, as noted above, this factor may change if habits established during a temporary water shortage have permanent effect on consumptive patterns. The City will require about 7,400 hospital beds, and 6,500 acres of neighborhood and community recreational places. The projected 3,500 firemen will be combatting about 11,000 fires citywide, while the 8,500 person police force will be responsible for a wide variety of duties, including the investigation of over 320,000 felonies.

D. secondary economic effects of construction and operation

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D. SECONDARY ECONOMIC EFFECTS OF CONSTRUCTION AND OPERATION

1. THE REGIONAL IMPACT MULTIPLIER SYSTEM (RIMS)

The overall economic effects of construction expenditures and subsequent additions to the annual outlays for operation and maintenance can be estimated through the use of multipliers. The effects estimated include the total increase in the output of goods and services caused by the expenditures, the total increase in earnings, and the overall increase in employment.

An input-output (I-O) model of industrial interaction, the Regional Impact Multiplier System (RIMS), is used here. The method was developed by the U.S. Department of Commerce to assist in the analysis of project effects in regions potentially affected by major projects. Los Angeles County is the region within which multipliers and their effects are estimated here.

RIMS generates industry-specific regional multipliers, using the national I-O model (comprised of 478 sectors) to generate detail at the 4-digit Standard Industrial Code (SIC) level. For a specific industry within which a proposed change is being examined, a multiplier is built up from three components or effects: initial expenditures (always equal to 1.000), direct effects, and indirect-induced effects.

The process of direct effect estimation is illustrated in Figure IX-5. The national table yields a column of the direct input requirements or requirement coefficients needed for the industry under study, e.g., the construction of wastewater facilities. County Business Patterns for the study area provide a file of 4-digit SIC industries in the region which is compared with the direct input requirements from the national table. Requirements that are not available in the region are removed, and an edited input requirements column results. To be consistent with the Bureau of Economic Analysis' county earnings data, the supplying industries' requirements are aggregated to the 2-digit level. As shown in Figure IX-5, the Department of Commerce data are used to compute location quotients for each industry's proportion for the nation. If the region is just self-sufficient, the ratio or location quotient will be one. If the location quotient is less than one, the region presumably imports part of that requirement; if greater than one, the region is probably an exporter of that good. A complete tally results in the regionalization of the edited national direct effects for the specific industry, and summing the column yields the direct effect component of the region's output multiplier for that specific industry.

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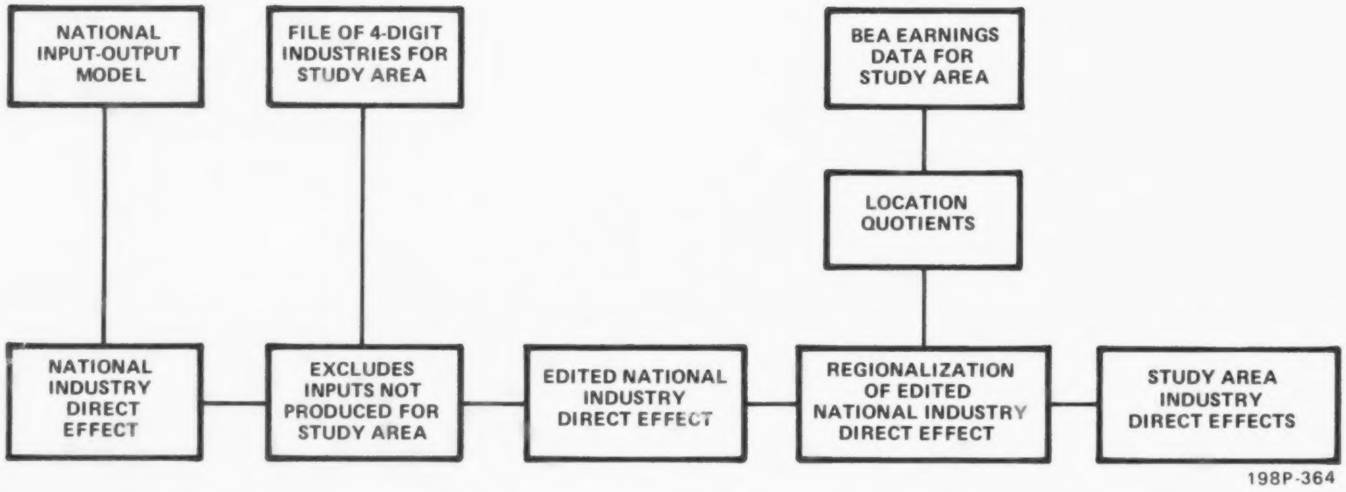
NATIONAL INPUT-OUTPUT MODEL
FILE OF 4-DIGIT INDUSTRIES FOR STUDY AREA
BEA EARNINGS DATA FOR STUDY AREA
LOCATION QUOTIENTS
NATIONAL INDUSTRY DIRECT EFFECT
EXCLUDES INPUTS NOT PRODUCED FOR STUDY AREA
EDITED NATIONAL INDUSTRY DIRECT EFFECT
REGIONALIZATION OF EDITED NATIONAL INDUSTRY DIRECT EFFECT
STUDY AREA INDUSTRY DIRECT EFFECTS
198P-364

Figure IX-5. Direct effect estimation.

Additional expenditures and production result from the direct effect. This indirect interaction among the region's industries is estimated as a function of the direct effect. Together, the direct and indirect effects result in increased household incomes and expenditures. This induced effect is estimated by making households another industry in the model.

Each specific industry has its own multiplier value, the magnitude depending upon the nature and strength of the industrial linkages within the regional economy. For Los Angeles, the output multiplier for the construction of new wastewater facilities is estimated to be 4.921. Operations and maintenance of wastewater facilities in this region has an output multiplier value of 2.811 to estimate the total increase in the output of goods and services stemming from the additional expenditures.

The overall earnings increase in the region is estimated as a proportion of the output increase, and this proportion, too, is industry and region specific. For the construction of new wastewater facilities in Los Angeles County, the proportion of increased output which will be increased earnings is 0.372. For operations and maintenance expenditures, the proportion of earnings in increased output is 0.308. These earnings increase cover wage and salary payments, proprietors income, and supplemental labor income, and excludes property income, transfer payments, and income from government employment.

Overall increases in employment vary directly with earnings. For Los Angeles County, 83.27 manyears of employment opportunities are added for each million dollars in earnings. This factor is based upon 1975 experience data for Los Angeles.

2. RESULTS OF RIMS APPLICATION

Using the factors described above, the construction cost effects for each wastewater system element are displayed in Table IX-15. These effects are summarized for the five selected alternatives in Table IX-16. Increased output, earnings, and employment from expenditures for operations and maintenance for the wastewater system element are shown in Table IX-17. They are summarized for the five selected alternatives in Table IX-18. Dollar values in both Table IX-15 and Table IX-16 are in 1975 values. No effects for Terminal Island or additional collection systems are shown. The time periods for construction and operations and maintenance for each project element, for each of the five alternatives, are given in Table IX-19.

a. Earnings. In 1974, earnings in Los Angeles County were in excess of $32 billion. Depending upon the alternative, the increased earnings (in 1975 dollars) varies from about $225 million to $635 million for construction. The bulk of this increase occurs over the early 5 years of the programs visualized, so the annual rate is not much more than

Table IX-15. Secondary economic impacts of construction by wastewater system element.

	CONSTRUCTION COST 1975 DOLLARS	INCREASED OUTPUT	INCREASED EARNINGS	DIRECT EARNINGS	INDIRECT EARNINGS	INDIRECT LABOR (MANYEARS)	DIRECT LABOR (MANYEARS)	TOTAL LABOR (MANYEARS)
HTP 200 mgd and Modernization	$121,959,000	$ 600,160,000	$223,260,000	$ 60,980,000	$162,280,000	13,513	2,132	15,645
HTP 307 mgd and Modernization	$171,282,000	$ 842,879,000	$313,551,000	$ 85,641,000	$227,910,000	18,978	2,994	21,972
HTP 307 mgd, with Flexibility and Modernization	$181,682,000	$ 894,057,000	$332,589,000	$ 90,841,000	$241,748,000	20,130	3,176	23,306
HTP 387 mgd and Modernization	$272,500,000	$1,340,973,000	$498,842,000	$136,250,000	$362,592,000	30,193	4,764	34,957
HTP 397 mgd and Modernization	$287,182,000	$1,413,223,000	$525;719,000	$143,591,000	$382,128,000	31,820	5,021	36,841
HTP Sludge Processing and Disposal	$ 14,007,000	$ 68,928,000	$ 25,641,000	$ 7,004,000	$ 18,637,000	1,552	245	1,797
Sepulveda 40 mgd	$ 38,356,000	$ 188,750,000	$ 70,215,000	$ 19,178,000	$ 51,037,000	4,250	671	4,921
Sepulveda 30 mgd Added	$ 21,503,000	$ 105,816,000	$ 39,364,000	$ 10,752,000	$ 28,612,000	2,383	376	2,759
Sepulveda 15 mgd Added	$ 11,569,000	$ 56,931,000	$ 21,178,000	$ 5,785,000	$ 15,393,000	1,282	202	1,484
La Cienega 75 mgd Water Reclamation Plant	$ 56,189,000	$ 276,506,000	$102,860,000	$ 28,095,000	$ 74,765,000	6,226	982	7,208
EVIS I	$ 7,731,000	$ 38,044,000	$ 14,152,000	$ 3,866,000	$ 10,286,000	857	135	992
EVIS II	$ 4,604,000	$ 22,656,000	$ 8,428,000	$ 2,302,000	$ 6,126,000	510	80	590
Los Angeles-Glendale Water Reclamation Plant 10 mgd Added	$ 5,937,000	$ 29,216,000	$ 10,868,000	$ 2,969,000	$ 7,899,000	658	104	762
AVORS (35 cfs)	$ 42,377,000	$ 208,537,000	$ 77,576,000	$ 21,189,000	$ 56,387,000	4,695	741	5,436
Griffith Reclaimed Water Delivery	$ 819,000	$ 4,030,000	$ 1,499,000	$ 410,000	$ 1,089,000	91	14	105
Sepulveda Reclaimed Water Delivery	$ 758,000	$ 3,730,000	$ 1,388,000	$ 379,000	$ 1,009,000	84	13	97
Woodman Avenue Relief Sewer	$ 2,672,000	$ 13,149,000	$ 4,891,000	$ 1,336,000	$ 3,555,000	296	47	343

Table IX-16. Summary of secondary economic impacts of construction for selected alternatives.

	NO PROJECT	B4C	C3	CX	E2
Construction Cost	$ 121,959,000	$ 276,566,000	$ 347,057,000	$ 293,263,000	$ 343,155,000
Increased Output	600,160,000	1,360,980,000	1,707,867,000	1,443,147,000	1,688,664,000
Increased Earnings	223,260,000	506,284,000	635,326,000	536,850,000	628,172,000
Increased Indirect Earnings	162,280,000	367,998,000	461,796,000	390,217,000	456,591,000
Increased Indirect Labor (Manyears)	13,513,000	30,645,000	38,454,000	32,494,000	38,023,000
Increased Total Labor (Manyears)	15,645,000	35,479,000	44,522,000	37,621,000	44,021,000

$100 million for the highest earning years. The effects of operations and maintenance outlays is to increase earnings by $200 to $400 million, and these monies are distributed over 20 years or more, depending upon the particular alternative.

A peak year for earnings for the alternatives (excluding No Project) might be $125 million in earnings generated. This would be about 0.4 percent of 1974's earnings. The amount is impressive, but the relative impact in regional earnings would be quite minor for a peak year, and much more so for other years during a project lifespan.

b. Employment. Total labor manyears generated by construction expenditures vary from about 15,000 for No Project to 44,000 for the C3 or E2 alternatives. These, too, would apply largely to the early 5 or 6 years. Total wage and salary employment in Los Angeles County was slightly over 3,000,000 jobholders from 1973 through 1976. The project effects might peak at 15,000 in the early years, which would be 0.5 percent, at most, of the employed force. For other years, the relative impact would be much less.

In the case of unemployment, however, the impact could have higher visibility. In recent years, the unemployed in Los Angeles County have numbered in the area of 300,000. A peak year of 15,000 of new job opportunities would represent a full 5 percent of the unemployed, and, should the labor effects engendered by the projects be drawn largely from the locally unemployed roster, a beneficial impact of significant dimensions would result.

Table IX-17. Secondary economic impacts of operations by wastewater system element.

	O&M COST	INCREASED OUTPUT	INCREASED EARNINGS	DIRECT EARNINGS	INDIRECT EARNINGS	INDIRECT LABOR (MANYEARS)	DIRECT LABOR (MANYEARS)	TOTAL LABOR (MANYEARS)
HTP 200 mgd and Modernization	$ 235,390,000	$ 661,681,000	$ 203,798,000	$ 96,510,000	$ 107,288,000	8,934	6,434	15,368
HTP 307 mgd and Modernization	371,582,000	1,044,517,000	321,711,000	116,505,000	205,206,000	17,088	7,767	24,855
HTP 307 mgd, with Flexibility and Modernization	371,582,000	1,044,517,000	321,711,000	116,505,000	205,206,000	17,088	7,767	24,855
HTP 387 mgd and Modernization	394,000,000	1,107,534,000	341,120,000	116,505,000	224,615,000	18,704	7,767	26,471
HTP 397 mgd and Modernization	397,154,000	1,116,400,000	343,851,000	116,505,000	227,346,000	18,931	7,767	26,698
Sepulveda 40 mgd	44,968,000	126,405,000	38,933,000	14,850,000	24,083,000	2,065	990	3,055
Sepulveda 30 mgd Added	22,580,000	63,472,000	19,549,000	4,800,000	14,749,000	1,228	320	1,548
Sepulveda 15 mgd Added	3,948,000	11,098,000	3,418,000	840,000	2,578,000	215	56	271
La Cienega 75 mgd Water Reclamation Plant	58,500,000	164,444,000	50,649,000	14,850,000	35,799,000	2,981	990	3,971
EVIS I	588,000	1,653,000	509,000	188,000	321,000	27	12.5	39.5
EVIS II	289,000	812,000	250,000	92,000	158,000	13	6.2	19.2
Los Angeles-Glendale Water Reclamation Plant 10 mgd Added	4,956,000	13,931,000	4,291,000	1,260,000	3,031,000	252	84	336
AVORS (85 cfs)	3,192,000	8,973,000	2,764,000	1,021,000	1,743,000	145	68	213
Griffith Park Reclaimed Water Delivery	2,218,000	6,235,000	1,920,000	710,000	1,210,000	101	47	148
Sepulveda Reclaimed Water Delivery	1,432,000	4,025,000	1,240,000	458,000	782,000	65	31	96
Woodman Avenue Relief Sewer	170,000	478,000	147,000	54,000	93,000	8	4	12

Table IX-18. Summary of secondary economic impacts of operations and maintenance for selected alternatives.

	NO PROJECT	B4C	C3	CX	E2
Operations and Maintenance Cost	$ 235,390,000	$ 452,561,000	$ 402,734,000	$ 401,174,000	$ 511,061,000
Increased Output	661,681,000	1,272,148,000	1,132,086,000	1,127,700,000	1,436,592,000
Increased Earnings	203,798,000	391,821,000	348,682,000	347,331,000	442,470,000
Increased Indirect Earnings	107,208,000	252,118,000	230,392,000	228,856,000	287,917,000
Increased Indirect Labor (Manyears)	8,934,000	21,054,000	19,185,000	19,057,000	24,035,000
Increased Total Labor (Manyears)	15,368,000	30,368,000	27,071,000	26,995,000	34,339,000

Table IX-19. Summary of construction and operations and maintenance dates for elements of major alternatives.

PROJECTS	NO PROJECT		B4C		C3		CX		E2	
	CONSTR.	O&M	CONSTR.	O&M	CONSTR.	O&M	CONSTR.	O&M	CONSTR.	O&M
HTP Secondary Conversion (307 mgd)	1977-82	82-2000	77-82	82-2000	-	-	-	-	78-82	82-2000
HTP Conversion Flexibility									1977	
HTP Secondary Conversion (397 mgd)			-	-	77-82	82-2000	-	-	-	-
HTP Secondary Conversion (387 mgd)			-	-	-	-	77-82	82-2000	-	-
HTP Modernization and 200 mgd Secondary (No Project)	77-82	82-2000	-	-	-	-	-	-	-	-
HTP Sludge Processing and Disposal			78-97		78-97		78-97		78-97	
Sepulveda Water Reclamation Plant (40 mgd)			77-80	79-2000	-	-	-	-	77-80	79-2000
Sepulveda Plant 30 mgd Addition			79-80	81-2000	-	-	-	-	79-80	81-2000
Sepulveda Plant 15 mgd Addition			92-93	94-2000	-	-	-	-	92-93	94-2000
La Cienega Water Reclamation Plant (75 mgd)			-	-	-	-	-	-	82-85	86-2000
East Valley Interceptor Sewer:										
EVIS I			78-79	80-2000	-	-	-	-	78-79	80-2000
EVIS II			82-83	84-2000	-	-	-	-	82-83	84-2000
Los Angeles-Glendale 10 mgd Addition			88-89	89-2000	-	-	88-89	89-2000	88-89	89-2000
AVORS (85 cfs)			-	-	77-79	80-2000	-	-	-	-
Griffith Park Reclaimed Water Delivery System (9 mgd)			77-78	79-2000	77-78	79-2000	77-78	79-2000	77-78	79-2000
Sepulveda Dam Recreation Area Reclaimed Water Delivery System (9 mgd)			1980	81-2000	-	-	-	-	1980	81-2000
Woodman Avenue Relief Sewer (54 cfs)			-	-	82-83	84-2000	-	-	-	-
TOTAL CAPACITY (SECONDARY OR BETTER)		220		422		417		417		422

E. impacts on transportation and circulation

E. IMPACTS ON TRANSPORTATION AND CIRCULATION

1. TRANSPORTATION ANALYSIS

To the degree that wastewater facilities accommodate growth and that such growth has the potential for detrimentally affecting the ambient air quality, there will be secondary impacts that require analysis and mitigation (Chapter X). Population growth generally results in increased automobile traffic which, in turn, affects air quality due to automotive emissions of air pollutants. If population increases from persons relocating to more desirable housing also result in longer commutes by automobile, the effect could be adverse to meeting future air quality standards. To award a grant, EPA must be able to determine that the award action neither causes nor contributes to the violation of air quality standards. Within the City of Los Angeles, these standards are currently being exceeded. EPA has established a policy of seeking a net reduction in emissions; at the very least, no increase in air pollutant emissions will be permitted for any project in which EPA is a participant.

Motor vehicle traffic in the Los Angeles area can be characterized by the total vehicle miles traveled (VMT) in the area in a specified time period. Existing and projected VMT per day data for the region, highlighting the differential service area component, have been estimated for this EIS. The model is discussed in Appendix IIA.

Transportation models are valuable tools in forecasting future demand for transportation systems. The trip generation modeling process develops a functional relationship between trips and volumes (both production and attraction) and land use and socioeconomic characteristics at both ends of the trip. The modeling process assumes that urban travel patterns now, and in the future, are, and will continue to be, a function of these characteristics, and that the interrelationships developed will not materially change over time.

The SCAG-76 data base, as applied to the South Coast Air Basin, including Los Angeles City, provides a framework to evaluate and select the wastewater treatment alternative best able to achieve lowest air quality impacts. The transportation analysis prepared for this EIS begins with the planning policy contained in the Los Angeles Concept Plan (Chapter IV), and proceeds through land use, socioeconomic characteristics, and trip generation to effectively build environmental planning into the decisionmaking process. The flow diagram in Figure IX-6 presents a conceptual framework for relating growth and land use to transportation.

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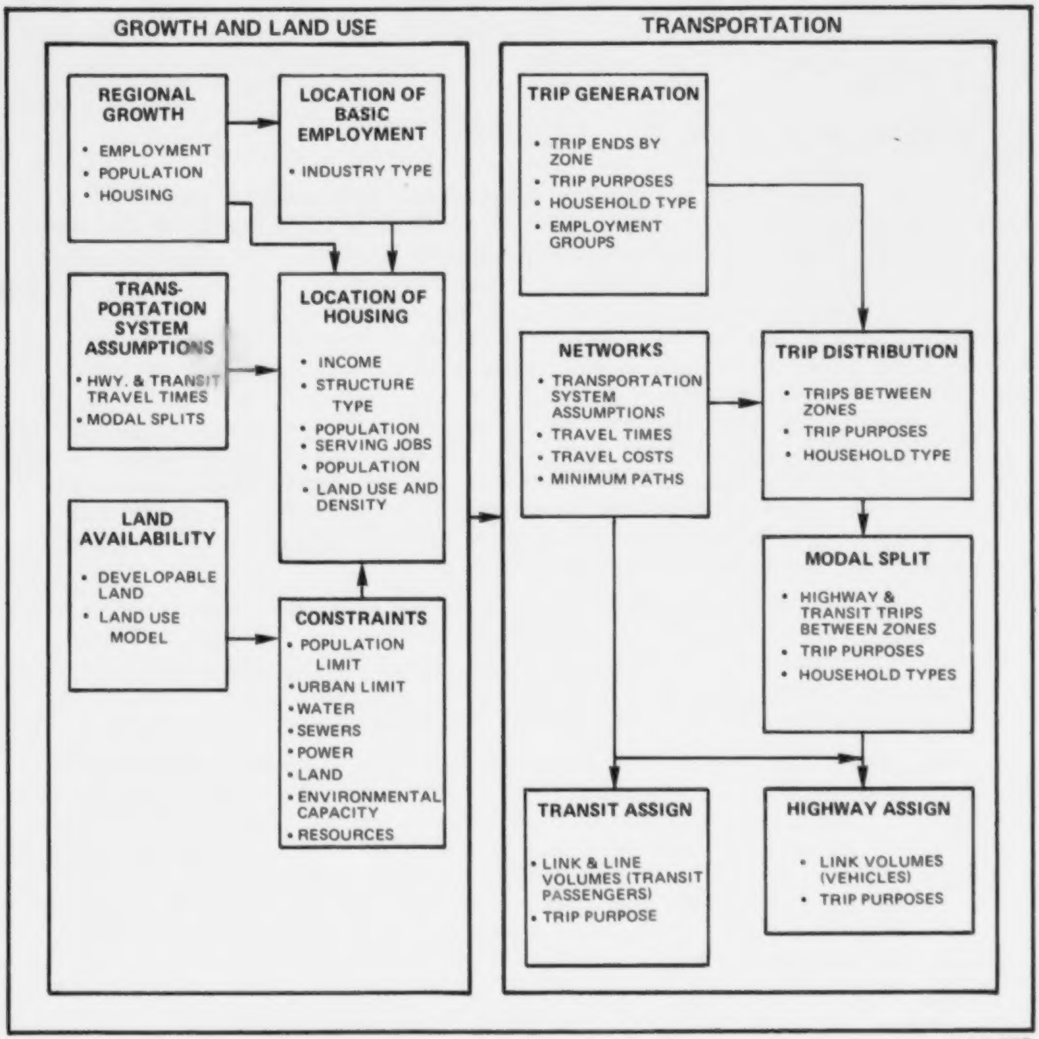
GROWTH AND LAND USE
REGIONAL GROWTH
• EMPLOYMENT
• POPULATION
• HOUSING
LOCATION OF BASIC EMPLOYMENT
• INDUSTRY TYPE
TRANS-PORTATION SYSTEM ASSUMPTIONS
• HWY. & TRANSIT TRAVEL TIMES
• MODAL SPLITS
LOCATION OF HOUSING
• INCOME
• STRUCTURE TYPE
• POPULATION
• SERVING JOBS
• POPULATION
• LAND USE AND DENSITY
LAND AVAILABILITY
• DEVELOPABLE LAND
• LAND USE MODEL
CONSTRAINTS
• POPULATION LIMIT
• URBAN LIMIT
• WATER
• SEWERS
• POWER
• LAND
• ENVIRONMENTAL CAPACITY
• RESOURCES
TRANSPORTATION
TRIP GENERATION
• TRIP ENDS BY ZONE
• TRIP PURPOSES
• HOUSEHOLD TYPE
• EMPLOYMENT GROUPS
NETWORKS
• TRANSPORTATION SYSTEM ASSUMPTIONS
• TRAVEL TIMES
• TRAVEL COSTS
• MINIMUM PATHS
TRIP DISTRIBUTION
• TRIPS BETWEEN ZONES
• TRIP PURPOSES
• HOUSEHOLD TYPE
MODAL SPLIT
• HIGHWAY & TRANSIT TRIPS BETWEEN ZONES
• TRIP PURPOSES
• HOUSEHOLD TYPES
TRANSIT ASSIGN
• LINK & LINE VOLUMES (TRANSIT PASSENGERS)
• TRIP PURPOSE
HIGHWAY ASSIGN
• LINK VOLUMES (VEHICLES)
• TRIP PURPOSES

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Figure IX-6. Key factors in circulation analysis.

Public infrastructure investments, including the construction of increased wastewater treatment plant capacity and extended trunk sewers, can contribute to where, how much, and in what form growth of population shifts could be expected to occur over the life of the project (E.I.C., Inc., 1975). Local and regional economic activity and land use plans that stimulate and focus population location are the major inputs into this analysis. In the case of Los Angeles and the contract cities of the Hyperion system, shifts in population from central areas to the San Fernando Valley may be more important than overall growth. Therefore, a transportation model that is used to estimate future vehicle miles traveled (VMT) and emissions must:

- be sensitive to changes in land uses, including residential, commercial, and employment areas
- account for longer trip lengths due to redistributed growth patterns
- produce results that are compatible with the air quality analysis

A growth factor model which projects travel patterns on the basis of anticipated differential zonal growth rates and existing interzonal movements meets these criteria better than a simple model that assumes a per capita trip generation rate and average trip length to commute VMT. The FRATAR method utilized in this section assumes that future trips can be estimated for any zone, and distributed to movement involving that zone (based on the existing trip interchange between that zone and every other zone). It is further assumed that this distribution can be expected to grow proportional to every other zone. This model analyzes future growth scenarios for land use, taking into consideration zone-to-zone trip lengths, and computes the spatial distribution of emissions. The methodology for secondary air quality impact analysis is given in Figure IX-7 and discussed below.

a. Analysis Factors. The estimation of future VMT takes into consideration the primary growth and land use factors that determine future demand for transportation systems given in Figure IX-6. The overall economic vitality of an area promotes growth and resource availability, including infrastructure and wastewater systems, acts to limit or form the total amount of growth and/or the distribution of the growth. The four major steps involved in estimating future VMT are:

- define the regional growth
- spatially allocate growth
- estimate trip generation
- estimate trip distribution

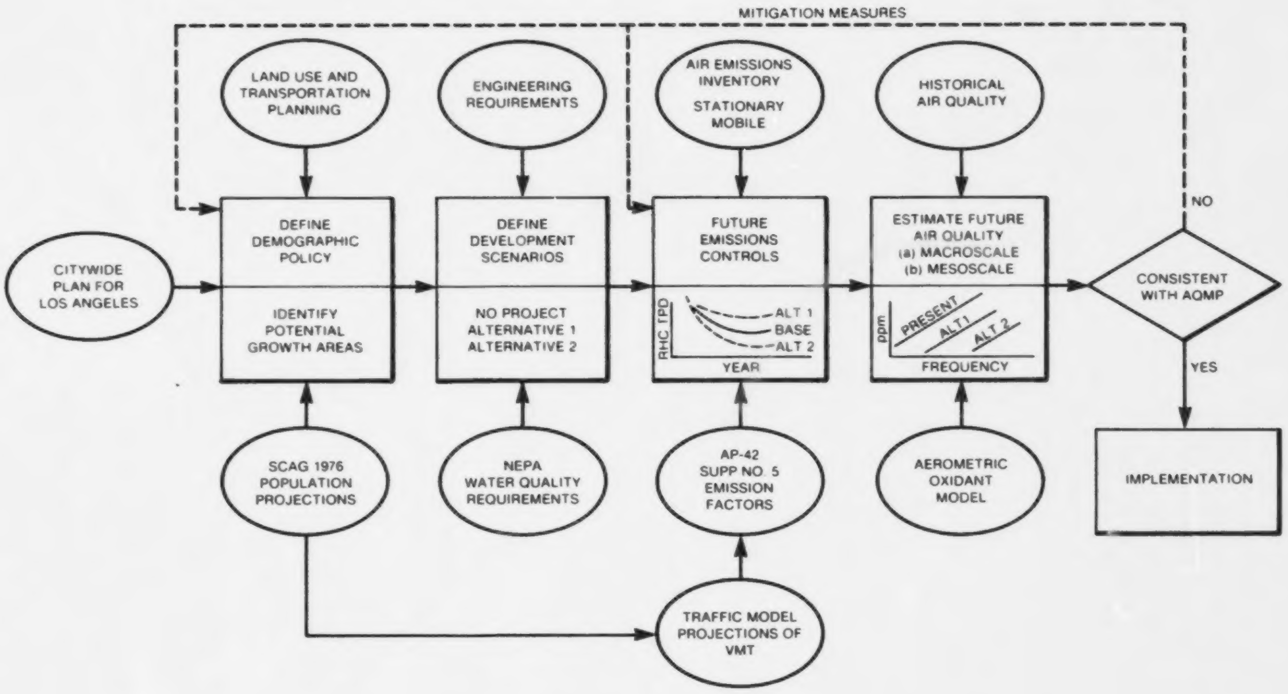
MITIGATION MEASURES
LAND USE AND TRANSPORTATION PLANNING
ENGINEERING REQUIREMENTS
AIR EMISSIONS INVENTORY STATIONARY MOBILE
HISTORICAL AIR QUALITY
CITYWIDE PLAN FOR LOS ANGELES
DEFINE DEMOGRAPHIC POLICY
IDENTIFY POTENTIAL GROWTH AREAS
DEFINE DEVELOPMENT SCENARIOS
NO PROJECT
ALTERNATIVE 1
ALTERNATIVE 2
FUTURE EMISSIONS CONTROLS
RHC TPD
ALT 1
BASE
ALT 2
YEAR
ESTIMATE FUTURE AIR QUALITY
(a) MACROSCALE
(b) MESOSCALE
ppm
PRESENT
ALT 1
ALT 2
FREQUENCY
NO
CONSISTENT WITH AQMP
YES
IMPLEMENTATION
SCAG 1976 POPULATION PROJECTIONS
NEPA WATER QUALITY REQUIREMENTS
AP-42 SUPP NO. 5 EMISSION FACTORS
AEROMETRIC OXIDANT MODEL
TRAFFIC MODEL PROJECTIONS OF VMT

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Figure IX-7. Methodology for secondary air quality impact analysis.

With an assumed level of economic growth forecasted, future population, employment, and housing can be estimated. The Southern California Association of Governments (SCAG) made these forecasts and allocated the growth to Regional Statistical Areas (RSA) based on land and public service availability (SCAG-76).

The SCAG-76 population forecast is slightly lower than the SCAG-EO or City of Los Angeles Plan, but somewhat higher than the Department of Finance EO forecast.

Given the historical trends in birthrates, household formation, and net regional migration, some population growth appears probable. In general, the SCAG-76 forecast accommodates that population growth in a manner which avoids irrevocable negative environmental impacts. SCAG studies have shown that exaggerated dispersal of the same total population could have significant negative effects upon open space, housing quality, water and sewer systems, transportation, air quality, and the accessibility of jobs to the urban poor and possibly positive effects only on seismic safety. Concentrating the same population growth would tend to have relatively positive effects on open space, housing quality, water and sewer facilities, and job accessibility to poor with negative effects on seismic safety, community disruption (high housing recycle rates), transportation congestion, and possibly air quality and energy.

The trip and VMT scenarios reflect a very low level of transit—equivalent to the 1967 LARTS survey data. This represents the highest level of VMTs and emissions anticipated for 1990. In order to define a band within which the "true" emissions level will fall, a very optimistic "High Transit" scenario was analyzed to underscore the effects of cluster versus dispersed growth. Ideally, clustered housing, consistent with the adopted Centers Concept, could make alternate modes of transportation—such as mass transit, walking, or biking—more attractive, while dispersion of housing and employment tends to reinforce present propensity to one person per car travel.

The high-transit, clustered scenario used for comparison purposes assumes:

- 40 percent reduction of short-length (0 to 3.5 mile) surface street trips
- 20 percent reduction of medium-length (3.5 to 6.2 mile) surface street trips
- 20 percent reduction of long (> 6.2 mile) freeway trips to be achieved by a combination of:
    - maximum carpool and vanpool programs
    - centers area transit in major activity centers, such as downtown, Century City, and the airport
    - minibus service in high activity centers

- express subscription bus service
- increased bicycling or walking

Once the growth scenarios have been selected and the growth allocated throughout the region, then the VMT can be estimated. Briefly, the transportation model works as follows:

- Interzonal trips are generated by a Department of Transportation gravity model for 1974, and a triangular trip table is created.
- Growth factors are computed, based on new demographic data for each scenario.
- Using the FRATAR model, the interzonal trips are scaled up (per the growth factors), and 1990 trip tables are created.
- VMT is computed by multiplying the interzonal trips by either the zone-to-zone airline distance or distance within grid cells.
- Emissions were computed by multiplying vehicle emissions factors by the VMT for each scenario. Emissions are computed for grid cells in order to be compatible with the air quality model (the details of the transportation model are discussed in Appendix IIA).

The results of the transportation model runs are trips, VMT, and emissions of reactive hydrocarbons, nitrogen oxides, and carbon monoxide for 1974, and a variety of 1990 low-transit and high-transit growth scenarios. The results have been organized in baseline 1974 and projected 1990 SCAG-76 low transit. Model inputs for alternative growth scenarios and model outputs for the various growth scenarios and transit options are key results derived from the model.

Based on the demographic data given in Appendix IIA, Tables 1 and 2 for 1974 and 1990 respectively, triangular trip tables were prepared for the entire modeling region. Triangular VMT tables were prepared, using the corrected airline distances between zone centroids.

Estimates of daily trips within the Hyperion Service Area were computed using the traffic simulation model. Two basic conclusions can be drawn from the triangular trip Table IX-20 for 1974:

- A high proportion of trips are within the zones, due, in part, to the large size of the zones (intrazonal).
- The farther apart the zones are, the fewer the trips between the zones (interzonal).

The analysis of transportation effects on air quality requires identification and discussion of vehicle miles traveled (VMT), as well as trips. Based on airline distances between zones (times a correction factor to represent a "truer" trip length), VMTs were computed for the same table. Table IX-20 shows that although there are fewer trips between

Table IX-20. Projected 1974 weekday trips within the Hyperion Service Area.

VMT DUE TO TRIPS FROM ZONE TO ZONE			CBD-WILSHIRE CORRIDOR						SAN FERNANDO VALLEY				
		11. HAWTHORNE	16. SANTA MONICA	17. CULVER CITY	18. DOWNTOWN	23. SHERMAN OAKS	24. WEST HOLLYWOOD	25. GLENDALE	30. TARZANA	31. SEPULVEDA	32. BURBANK	33. LA CRESENTA	35. CHATSWORTH SAN FERNANDO
CBD-WILSHIRE CORRIDOR	11. HAWTHORNE	1,059											
	16. SANTA MONICA	698	1,065										
	17. CULVER CITY	835	1,073	952									
	18. DOWNTOWN	836	646	1,504	1,064								
	23. SHERMAN OAKS	169	686	315	208	233							
	24. WEST HOLLYWOOD	181	408	864	692	365	812						
	25. GLENDALE	168	161	379	960	89	708	670					
SAN FERNANDO VALLEY	30. TARZANA	147	194	172	325	201	223	155	917				
	31. SEPULVEDA	172	276	198	382	333	485	227	667	739			
	32. BURBANK	98	119	151	423	115	615	443	192	653	691		
	33. LA CRESENTA	66	59	100	383	40	173	629	73	119	391	296	
	35. CHATSWORTH SAN FERNANDO	98	146	121	285	95	198	158	444	653	607	124	843
Total within Hyperion Service Area		33,214,000	Average Trip = 6.8 Miles										
Total within San Fernando Valley		7,409,000	Average Trip = 5.4 Miles										
Total from Valley to CBD-Wilshire Corridor		3,334,000	Average Trip = 20.5 Miles										
Total within Hyperion Service Area (including external and through trips)		51,700,000											

distant zones, the long distance traveled can compensate to produce significant VMTs within the City.

Between 1974 and 1990, the internal trips (those with the origin and destination within the service area) will increase by 0.6 million (11.8 percent), and an internal VMT will increase 3.8 million (11.5 percent). Internal trips account for about 64 percent of the total VMT generated within the service area boundaries, and external and through trips account for the remaining 36 percent.

Table IX-21 shows the 1990 SCAG-76 trips and VMT within (internal) the Hyperion Service Area. There is an 11.8 percent increase in trips and an 11.5 percent increase in VMT over 1974 with the most dramatic increase in VMT in zone 30, the western San Fernando Valley.

In addition to trip tables, VMT and emissions within each traffic zone or cell, the internal trips and the fraction of through and external trips that occur within a particular cell were used to further refine VMTs and compute emissions. The resulting spatially distributed VMTs and emissions for the Hyperion Service Area and the basin are summarized in Tables 13 and 14 in Appendix IIA. Growth in the service area and every other part of the basin produces 24 percent more VMT but because of better vehicle emission controls, there is a 70 percent reduction in reactive hydrocarbon emissions. Figure IX-8 shows the baseline VMTs distribution over the entire basin.

b. Results. Tables IX-22 and IX-23 summarize the spatially distributed VMT and emissions for three major 1990 growth scenarios associated with different facilities plan alternatives.

Table IX-22 presents Scenario 3. This scenario projects baseline 1974 VMT to 1990. Such a scenario would result from multiple regionwide No Project decisions, combined with a strict moratorium on new development. It is presented as a baseline to identify the maximum regional air quality improvement possible for the South Coast Air Basin.

Table IX-23 presents the SCAG-76 growth with a more concentrated population than presented in Scenario 1. This concentrated population, consistent with the Centers Concept, will be further discussed in Chapter X, Mitigation Measures. This scenario could be achieved with Facilities Plan Alternatives B4C, C3, and E2, combined with more stringent land use and economic measures designed to make the Centers Concept a reality.

A comparison of the data demonstrates that growth outside the service area increases basin RHC emissions 50 tons per day (TPD), whereas growth inside the service area increases basin emissions 8 TPD. The high transit scenario reduces basin emissions below the no SCAG growth scenarios.

c. Conclusions. Table IX-24 summarizes VMT and emissions in the South Coast Air Basin for all scenarios run during both the Secondary Impact analysis

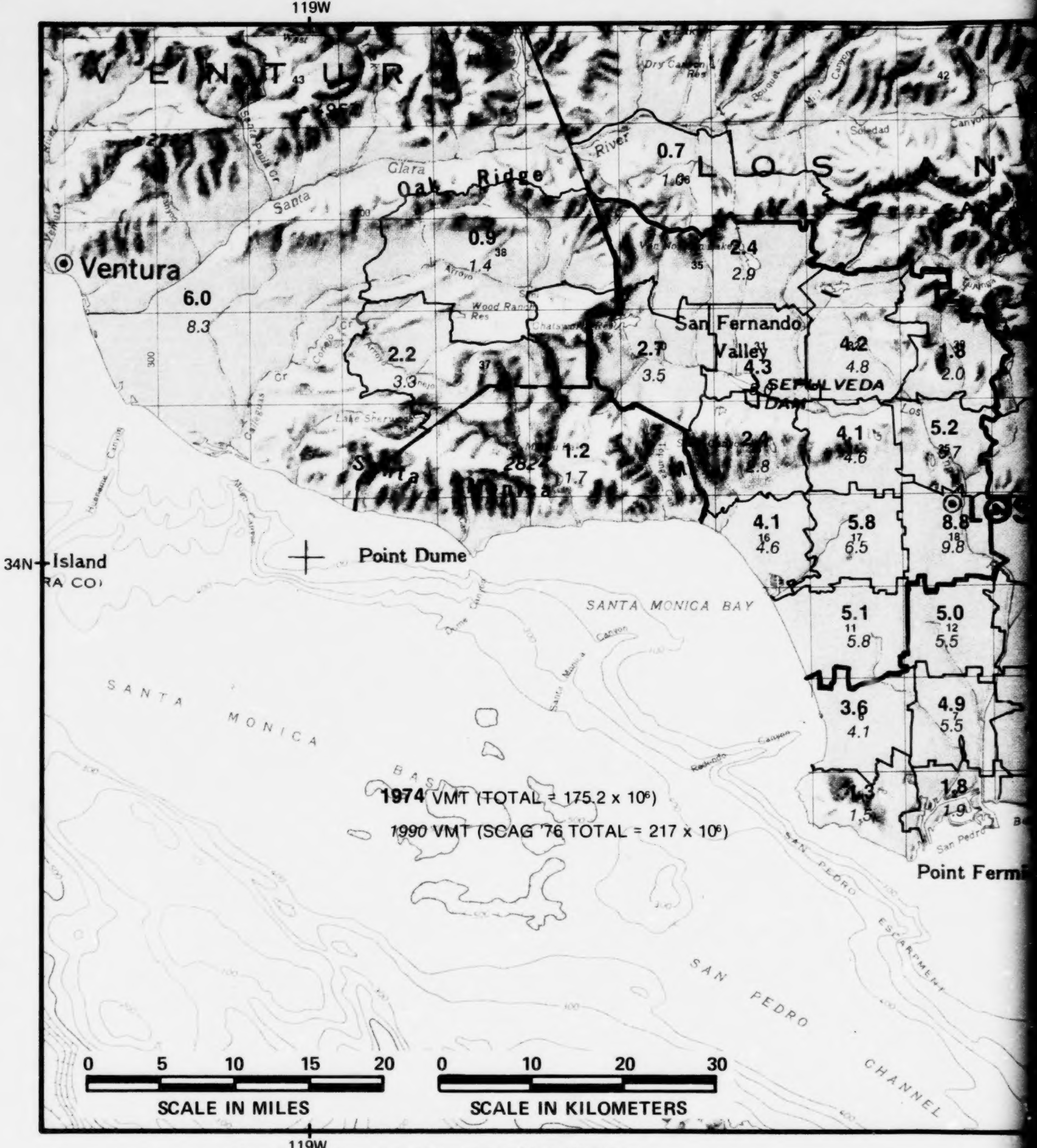
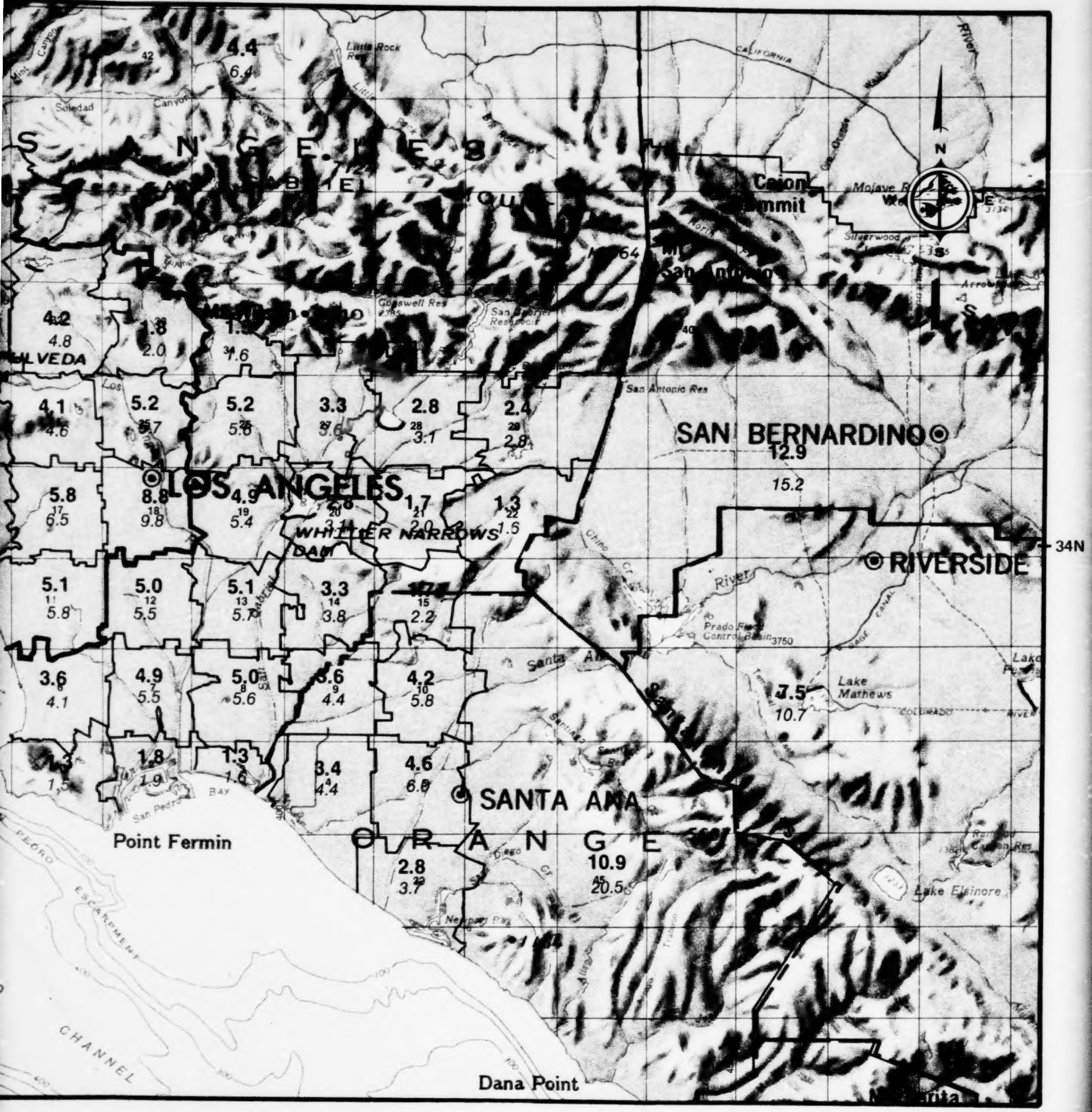

119W
V E N T U R
Ventura
6.0
8.3
0.9
38
1.4
Oak Ridge
Santa Clara
0.7
1.06
L O S A N
2.4
35
2.9
2.2
3.3
37
San Fernando Valley
2.7
3.5
4.3
SEPULVEDA DAM
4.2
4.8
1.8
2.0
5.2
5.7
1.2
1.7
282
2.4
2.8
4.1
4.6
4.1
16
4.6
5.8
17
6.5
8.8
18
9.8
LOS
Point Dume
34N
Island
SANTA MONICA BAY
5.1
11
5.8
5.0
12
5.5
3.6
4.1
4.9
5.5
1.3
1.5
1.8
1.9
Point Fermi
SANTA MONICA BASIN
SAN PEDRO CHANNEL
SAN PEDRO ESCARPMENT
1974 VMT (TOTAL = 175.2 x 10⁶)
1990 VMT (SCAG '76 TOTAL = 217 x 10⁶)
0 5 10 15 20
SCALE IN MILES
0 10 20 30
SCALE IN KILOMETERS
119W

Figure IX-8. Baseline VMTs distribution.



4.4
6.4
42
Little Rock Res
CALIFORNIA
Soledad
Canyon
S A N G E L E S
S A N G A B R I E L M O U N T A I N S
Cajon Summit
Mojave River
Silverwood
N
E
Mt San Antonio
Cogswell Res
San Gabriel Reservoir
4.2
4.8
1.8
2.0
1.5
1.6
SEPULVEDA
4.1
4.6
5.2
5.7
5.2
5.6
3.3
3.6
2.8
3.1
2.4
2.8
San Antonio Res
SAN BERNARDINO
12.9
15.2
5.8
6.5
8.8
9.8
LOS ANGELES
4.9
5.4
2.8
3.1
1.7
2.0
1.3
1.6
WHITTIER NARROWS DAM
Chino Cr
34N
RIVERSIDE
5.1
5.8
5.0
5.5
5.1
5.7
3.3
3.8
1.7
2.2
Santa Ana River
Prado Flood Control Basin
3.6
4.1
4.9
5.5
5.0
5.6
3.6
4.4
4.2
5.8
7.5
10.7
Lake Mathews
COLORADO RIVER
1.3
1.5
1.8
1.9
1.3
1.6
3.4
4.4
4.6
6.8
SANTA ANA
San Pedro Bay
Point Fermin
SAN PEDRO ESCARPMENT
O R A N G E
2.8
3.7
10.9
20.5
Lake Elsinore
Railroad Canyon Res
Newport Bay
CHANNEL
Dana Point

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Table IX-21. Projected 1990 weekday trips within the Hyperion Service Area (hundreds).

TRIPS FROM ZONE TO ZONE			CBD-WILSHIRE CORRIDOR						SAN FERNANDO VALLEY				
		11. HAWTHORNE	16. SANTA MONICA	17. CULVER CITY	18. DOWNTOWN.	23. SHERMAN OAKS	24. WEST HOLLYWOOD	25. GLENDALE	30. TARZANA	31. SEPULVEDA	32. BURBANK	33. LA CRESENTA	35. CHATSWORTH SAN FERNANDO
CBD-WILSHIRE CORRIDOR	11. HAWTHORNE	3,243											
	16. SANTA MONICA	581	3,262										
	17. CULVER CITY	984	1,264	2,916									
	18. DOWNTOWN	601	376	1,698	3,260								
	23. SHERMAN OAKS	81	672	228	107	713							
	24. WEST HOLLYWOOD	119	376	1,272	728	367	2,487						
	25. GLENDALE	89	85	316	1,616	49	817	2,053					
SAN FERNANDO VALLEY	30. TARZANA	48	102	71	112	196	113	58	2,808				
	31. SEPULVEDA	64	163	104	171	487	366	119	785	2,264			
	32. BURBANK	39	63	88	253	99	605	370	114	769	2,118		
	33. LA CRESENTA	23	23	47	225	20	114	570	28	69	442	907	
	35. CHATSWORTH SAN FERNANDO	28	58	45	99	63	97	66	369	770	505	70	1,615
Total within Hyperion Service Area		4,916,200											
Total within San Fernando Valley		1,363,300											
Total from Valley to CBD-Wilshire Corridor		162,400											

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Table IX-22. Spatially distributed VMT and vehicle emissions for 1990; no growth in the South Coast Air Basin, including the Hyperion Service Area.

ZONE	COMMUNITY	VMT x 10^6			EMISSIONS - TONS/DAY		
		FREEWAY	CITY STREETS	TOTAL	RHC	NO_x	CO
1	Palos Verdes	0.7	0.5	1.2	1.6	3.3	9.4
2	L.A. Harbor	0.6	1.1	1.7	2.3	4.3	14.5
3	Long Beach	0.6	0.7	1.3	1.7	3.3	10.0
4	Westminster	1.3	2.1	3.4	4.6	8.4	28.0
5	Santa Ana	2.3	2.3	4.6	5.9	11.6	35.0
6	Torrance	1.9	1.7	3.6	4.7	9.2	27.3
7	Paramount	1.3	3.6	4.9	6.6	11.5	42.3
8	Lakewood	1.7	3.2	4.9	6.6	12.0	41.0
9	Buena Park	1.4	2.2	3.6	4.8	8.8	29.1
10	Anaheim	1.6	2.5	4.1	5.5	10.3	33.8
11	Hawthorne/Inglewood *	2.3	2.8	5.1	6.7	12.9	40.2
12	Watts	1.9	3.1	5.0	6.6	12.1	40.5
13	Downey	1.8	3.3	5.1	6.8	12.3	42.0
14	Whittier	1.4	1.9	3.3	4.4	8.3	26.7
15	La Habra	0.7	1.0	1.7	2.2	4.1	13.5
16	Santa Monica *	1.8	2.3	4.1	5.4	10.3	32.3
17	Culver City *	2.2	3.6	5.8	7.8	14.3	47.7
18	Downtown L.A. *	2.6	6.1	8.7	11.7	20.7	73.9
19	East L.A.	1.2	3.9	5.1	6.7	11.5	42.6
20	El Monte	0.7	2.1	2.8	3.7	6.4	23.9
21	West Covina	0.7	1.0	1.7	2.2	4.3	13.5
22	Pomona	0.4	0.8	1.2	1.7	3.1	10.6
23	Sherman Oaks *	0.6	1.8	2.4	3.2	5.6	20.7
24	West Hollywood *	1.8	2.3	4.1	5.5	10.3	32.9
25	Glendale *	1.6	3.6	5.2	7.0	12.4	43.6
26	Pasadena	1.9	3.3	5.2	6.9	12.7	42.6
27	Arcadia	1.2	2.1	3.3	4.4	8.1	27.2
28	Baldwin Park	1.1	1.7	2.8	3.7	6.8	22.5
29	San Dimas	0.6	1.8	2.4	3.2	5.6	20.7
30	Tarzana *	1.5	1.2	2.7	3.5	7.1	20.2
31	Sepulveda *	1.5	2.8	4.3	5.7	10.4	35.3
32	Burbank *	1.6	2.6	4.2	5.6	10.2	34.1
33	La Cresenta *	0.7	1.1	1.8	2.4	4.4	14.7
34	Altadena	0.7	0.8	1.5	1.9	3.7	11.6
35	Chatsworth/San Fernando *	2.0	1.3	3.3	4.3	8.9	24.4
36	Newhall	0.1	0.6	0.7	1.0	1.6	6.3
37	Thousand Oaks/W. Valley	0.5	1.7	2.2	3.0	5.2	19.2
38	Moor./Simi/Santa Susana	0.5	0.4	0.9	1.2	2.4	6.7
39	Costa Mesa	1.7	1.0	2.7	3.5	7.4	20.0
40	San Bernadino County	8.5	4.3	12.8	16.4	34.9	90.8
41	Riverside County	5.2	2.3	7.5	9.5	20.5	52.1
42	North L.A. County	1.6	2.8	4.4	5.8	10.7	36.0
43	West Ventura County	5.1	0.9	6.0	7.4	17.2	37.5
44	Malibu/Calabasas	0.4	0.8	1.2	1.6	2.8	9.6
45	East Orange County	4.5	6.3	10.8	14.3	26.9	86.6
TOTALS		76.0	99.3	175.3	231.2	438.8	1393.1
* Hyperion Service Area		20.2	31.5	51.7	68.8	127.5	420.0

Table IX-23. Spatially distributed VMT and vehicle emissions for 1990; SCAG-76 forecast with high transit utilization.

ZONE	COMMUNITY	VMT x 10^6			EMISSIONS - TONS/DAY		
		FREEWAY	CITY STREETS	TOTAL	RHC	NO_x	CO
1	Palos Verdes	0.7	0.3	1.0	1.4	2.9	7.5
2	L.A. Harbor	0.6	0.8	1.4	1.8	3.4	10.7
3	Long Beach	0.7	0.5	1.2	1.5	3.1	8.5
4	Westminster	1.4	1.8	3.2	4.2	8.1	25.3
5	Santa Ana	2.4	1.9	4.3	5.6	11.4	32.4
6	Torrance	1.8	1.2	3.0	3.8	7.9	21.5
7	Paramount	1.3	2.8	4.1	5.5	9.9	34.8
8	Lakewood	1.6	2.5	4.1	5.5	10.2	33.5
9	Buena Park	1.5	1.7	3.2	4.1	8.0	24.6
10	Anaheim	2.0	2.3	4.3	5.5	10.7	33.1
11	Hawthorne/Inglewood *	2.2	2.0	4.2	5.4	10.9	31.7
12	Watts	1.8	2.2	4.0	5.3	10.1	31.6
13	Downey	1.8	2.4	4.2	5.5	10.4	33.0
14	Whittier	1.4	1.3	2.7	3.5	6.9	20.8
15	La Habra	0.8	0.9	1.7	2.2	4.2	12.8
16	Santa Monica *	1.7	1.6	3.3	4.3	8.4	25.3
17	Culver City *	2.1	2.6	4.7	6.1	11.6	36.4
18	Downtown L.A. *	2.5	4.5	7.0	9.3	17.0	57.6
19	East L.A.	1.1	2.9	4.0	5.5	9.6	34.7
20	El Monte	0.7	1.7	2.4	3.2	5.6	20.0
21	West Covina	0.7	0.7	1.4	1.8	3.6	10.7
22	Pomona	0.5	0.7	1.2	1.5	2.9	9.3
23	Sherman Oaks *	0.6	1.5	2.1	2.8	4.9	17.5
24	West Hollywood *	1.7	1.7	3.4	4.5	8.8	26.6
25	Glendale *	1.5	2.5	4.0	5.4	10.0	33.4
26	Pasadena	1.8	2.4	4.2	5.4	10.3	32.8
27	Arcadia	1.1	1.5	2.6	3.5	6.6	20.9
28	Baldwin Park	1.0	1.3	2.3	3.0	5.7	18.0
29	San Dimas	0.6	1.5	2.1	2.8	5.0	18.0
30	Tarzana *	1.6	0.9	2.5	3.2	6.8	18.0
31	Sepulveda *	1.4	2.3	3.7	5.0	9.2	30.4
32	Burbank *	1.5	2.0	3.5	4.6	8.7	27.5
33	La Cresenta *	0.6	0.8	1.4	1.9	3.6	11.2
34	Altadena	0.6	0.5	1.1	1.5	3.1	8.9
35	Chatsworth/San Fernando *	1.8	1.3	3.1	4.0	8.2	22.8
36	Newhall	0.2	0.6	0.8	1.1	1.8	6.8
37	Thousand Oaks/W. Valley	0.9	1.7	2.6	3.5	6.4	21.9
38	Moor./Simi/Santa Susana	0.7	0.4	1.1	1.3	2.9	7.4
39	Costa Mesa	1.8	0.9	2.7	3.5	7.4	19.2
40	San Bernadino County	8.5	4.1	12.6	16.0	34.1	87.9
41	Riverside County	6.3	2.5	8.8	11.1	24.4	60.3
42	North L.A. County	2.3	3.0	5.3	6.9	13.1	41.6
43	West Ventura County	6.0	0.9	6.9	8.5	19.9	42.9
44	Malibu/Calabasas	0.5	0.9	1.4	1.9	3.5	11.6
45	East Orange County	8.7	8.1	16.8	21.9	43.4	128.3
	TOTALS	83.0	82.6	165.6	215.8	424.6	1269.7
	* Hyperion Service Area	19.2	23.7	42.9	56.5	108.1	338.4

Table IX-24. Basinwide VMTs and vehicle emissions for various growth scenarios.

YEAR	GROWTH SCENARIO	LOW TRANSIT					HIGH TRANSIT			
		TRIPS x 10^6	VMT x 10^6	RHC TPD	NO_x TPD	CO TPD	VMT x 10^6	RHC TPD	NO_x TPD	CO TPD
1974	Present	17.6	175.2	1,106	824	8,145	—	—	—	—
1990	I - No growth (basinwide or region specific no project and building moratorium decisions):									
	No growth in SCAB	17.6	175.2	231	439	1,393	132.6	172	349	984
	No growth in Hyperion Service Area	20.8	211.3	281	520	1,715	161.0	210	414	1,234
1990	II - Coastal (without Valley hydraulic relief Alternative CX):									
	No San Fernando Valley growth	21.2	213.9	284	527	1,740	163.0	213	419	1,250
	Shifted San Fernando Valley growth to South City	21.5	216.3	288	532	1,761	164.8	215	423	1,266
	Displaced San Fernando Valley growth to SCAB	21.5	217.3	289	534	1,770	165.6	216	425	1,273
	Clustered growth in Central Business District	21.4	215.2	286	530	1,750	163.9	214	421	1,258
1990	III - Inland/Coastal, Coastal/AVORS, and maximum reclamation projects (with Valley hydraulic relief, Alternatives B4C, C3, and E2):									
	SCAG-76 Forecast	21.5	217.0	289	534	1,766	165.2	216	424	1,270
	San Fernando Valley and CBD clusters	21.4	216.2	287	531	1,758	164.5	215	422	1,264
	Clustered growth in San Fernando Valley	21.5	217.4	289	534	1,768	165.4	216	424	1,271

and the Mitigations Measures analysis. Several conclusions can be drawn from this table:

- Growth in the basin increases trips 4 million (23 percent), of which growth in the service area accounts for 0.8 million trips (4.5 percent).
- The effect of rearranging forecasted growth is relatively small—maximum clustering saves 3 TPD of RHC emissions and maximum dispersal increases RHC emissions 3 TPD.
- Growth in the basin increases RHC emissions 50 TPD, of which growth in the service area accounts for 8 TPD.
- High transit reduces VMT and RHC emissions by about 25 percent—or more than the amount generated by new growth.

Growth in the South Coast Air Basin will increase RHC emissions 22 percent over no-growth levels. Of this amount, growth in the Hyperion Service Area will contribute 15 percent with the San Fernando Valley growth accounting for 6 percent.

Within the Hyperion Service Area boundaries, 63 percent of the VMT is due to internal trips. Internal service area trips represent 17 percent of the basin VMT, and the regional core (zone 16, 17, 18, 24, 25) accounts for 53 percent of the total service area VMT.

The effect of the three types of growth scenarios on emissions of reactive hydrocarbons are given in Figure IX-9. Additional emissions due to growth in the service area is 8 TPD. Clustering all of this growth downtown could reduce this total savings to 5 TPD regionally with the low level of transit. Within the service area, clustering saves 2.3 TPD.

With a high level of transit, the savings in emissions due to clustering become more apparent. The combination of clustering growth and high transit more than offset the additional emissions due to growth (with a low level of transit).

2. CIRCULATION

Increase in population, employment, and urban development, as described in this Chapter, will create a greater burden on existing transportation systems. Moderate increases in the number of motor vehicles, vehicle miles traveled, and demand for improved public transportation facilities are anticipated within the Hyperion Service Area.

a. Increase in Motor Vehicles. Motor vehicle registration projections provide one index for estimating the number of vehicles which will be in use in the future. Motor registrations are expected to increase at the following annual rates:

MOBILE SOURCE EMISSIONS OF RHC FOR VARIOUS GROWTH SCENARIOS
(Assumming 1967 utilization of transit)

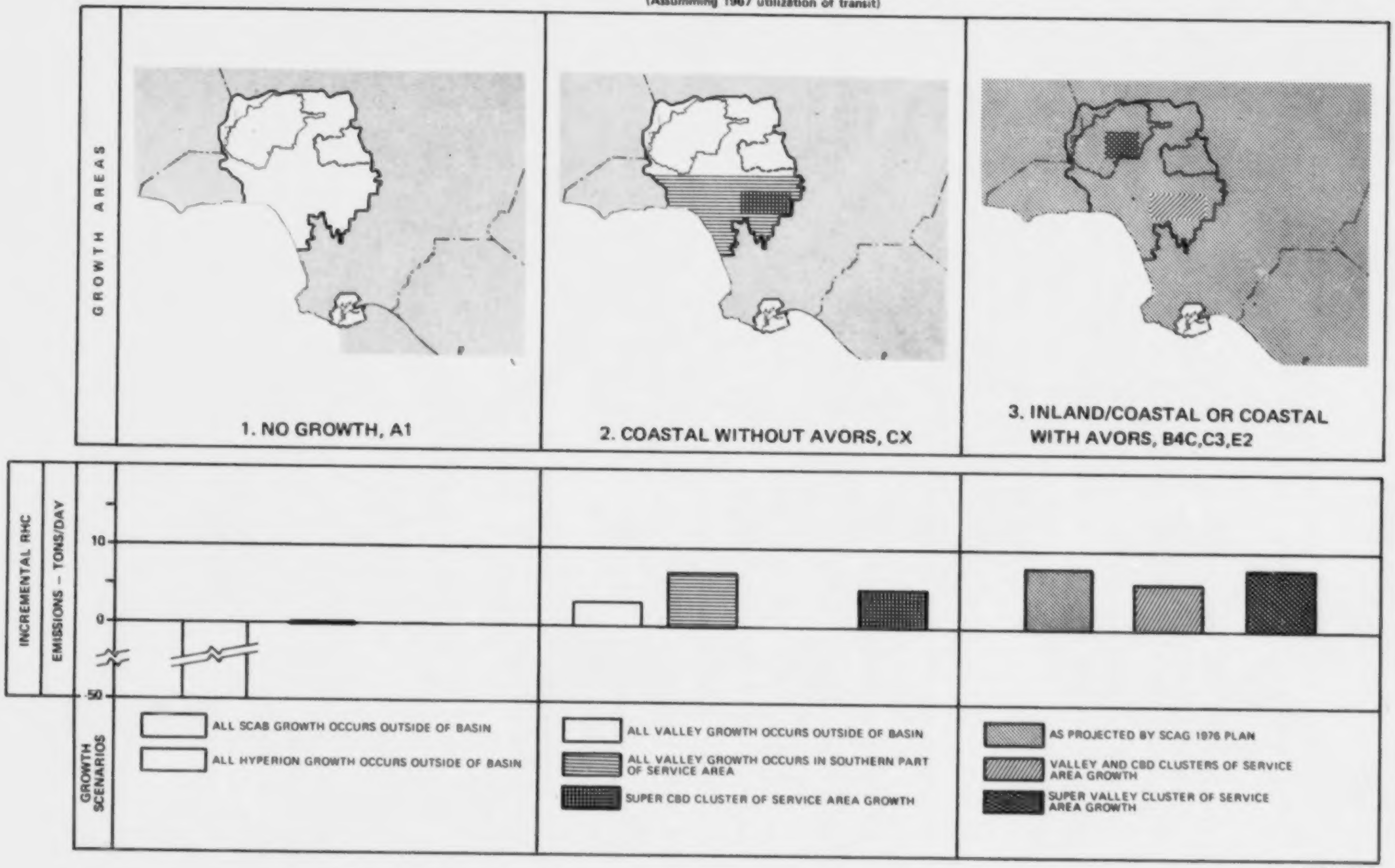

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Figure IX-9. Mobile emissions of RHC for various growth scenarios.

- automobile—4 percent
- commercial vehicles—6 percent
- motorcycles—5 percent

These vehicles could increase travel on existing freeways and surface streets, resulting in increases in commuting times, air pollutant emissions, fuel consumption, accidents, and demand for parking space, if present trends continue.

The number of motor vehicles per 100 persons has risen from 46 in 1960 to 67 in 1975, indicating a substantial increase in the number of families owning two or more cars. While the magnitude of future increases may be moderated by the rising costs in all facets of transportation, the current trend towards lighter, more fuel-efficient vehicles could actually encourage vehicle use. Continued dependence upon the automobile for almost 90 percent of all travel will preclude the reduction of both vehicle miles traveled (VMT) and motor vehicle air pollutant emissions. Increases in usage of heavy-duty vehicles and motorcycles will result in proportionately even greater air pollutant emissions.

b. Projected Changes in Vehicle Miles Traveled. Projected VMTs were computed based on present travel characteristics (i.e., low transit utilization and low carpooling), using the SCAG-76 planned growth forecast. Growth in the service area is projected to generate an additional 3,817,000 VMT (or about 11 percent) by 1990. A distribution of estimated VMT increases in the study area is shown in Table IX-25, and is extrapolated from the trends of the past decade. These estimates include a range of values, some of which are much higher than those made by SCAG and Caltrans, who assume that there will be reductions in VMT based upon energy conservation measures, transportation controls, and air pollution abatement efforts. Projections of VMT for the South Coast Air Basin, which are based upon implementation of a regional transportation plan, show that if successful, such programs could reduce the existing VMT or at least reduce its rate of increase. A discussion of the effects of transportation controls is included in Chapter IX.

c. Effects on Traffic Circulation. Further development or redevelopment of land within the service area will result in increased vehicle traffic. This will increase traffic congestion and travel times on surface streets. Assuming Caltrans proceeds to implement its bottleneck widening and ramp metering programs throughout the urbanized portion of the basin, then all freeways should operate at optimum efficiency, even during the peak hours. This can only be accomplished by longer delays at onramps or diverting vehicles to alternate surface street routes. Therefore, the greatest impact will be felt on the City's surface streets, particularly the major arterials. The maximum level of service characteristic of highway types is shown on Table IX-26.

Table IX-25. Distribution of estimated increases in VMT within the Hyperion Service Area, 1974-1990.

TYPE OF TRIP	AVERAGE TRIP LENGTH (MILES)	VMT	PERCENT OF TOTAL INCREASE
Activity Center	0-2	191,000	5
Community	2-6	802,000	21
Metropolitan	6-20	1,679,000	44
Intermetropolitan	20-60	916,000	25
Regional	Over 60	229,000	6
Total		3,817,000[1]	100

[1] Distribution of total VMT by vehicle type is estimated as follows:

	Surface Street	Freeway
Autos	81.7	79.1
Light Duty Trucks	13.3	12.9
Heavy Duty Trucks	5.0	8.0
Gas	3.4	5.4
Diesel	1.6	2.6

d. Freeway Capacities. The coupling between the freeway systems and land use patterns is something that is readily acknowledged, but not well understood. Historically older central cities have been spreading out horizontally. The automobile is the transportation system that has primarily developed with this land use pattern, but it is difficult to say which is the cause and which is the effect.

The land use and freeway patterns are a response to a wide array of economic, political, social, and technological factors that are not well understood. Even in trying to cope with problems of energy use, air pollution, congestion, and other costs, it is not clear exactly what new land use patterns will emerge as a desirable response. Most land use planning has remained in the hands of local governments, that often reflecting very local concerns.

Two factors would seem to suggest that the transportation patterns will be slow to change. First, the normal rate of change in land use patterns is historically slow. The rate of building new residences has been about 3 percent per year, coupled with about a 1 percent per year demolition rate. Some data for the rapidly growing Los Angeles region indicated commercial floor space was growing more rapidly, i.e., about

Table IX-26. Level of service characteristics by highway type.

Level of Service	Two-Lane	Multi-Lane Rural w/o Access Control	Urban and Sub-Urban Arterials	Controlled Access Highways
A	60 MPH 400 VPH	60 MPH 600 VPH Lane	>30 MPH Ave. 1840 VPH Lane Load Factor 0.0	60 MPH 1000 VPH Lane
B	50 MPH 900 VPH	55 MPH 1000 VPH Lane	>25 MPH Ave. 1120 VPH Lane Load Factor 0.1	55 MPH 1500 VPH Lane
C	40 MPH 1400 VPH	45 MHP 1500 VPH Lane	20 MHP Ave. 1360 VPH Lane Load Factor 0.3	50 MPH 1800 VPH Lane
D	35 MPH 1700 VPH	35 MPH 1800 VPH Lane	15 MPH Ave. 1620 VPH Lane Load Factor 0.7	40 MPH 1800 VPH Lane
E	30 MPH 2000 VPH	30 MPH 2000 VPH Lane	15 MPH Load Factor 0.7-1.0	30-35 MPH 2000 VPH Lane
F	<30 MPH <2000 VPH	<30 MPH <2000 VPH Lane	<15 MPH Back Ups	<30 MPH <2000 VPH Lane Stop & Go

6 percent per year, but this also probably included renovated space. A national estimate would be closer to the number given for houses. Both numbers are a reflection that building structures have very long useful lives, and sufficiently high first cost so they are not replaced rapidly. Thus, in the next 10 to 20 years, land use patterns are not likely to change dramatically unless considerable effort is applied in that direction.

In the short run, however, people will adapt their patterns of vehicle use within the constraints allowed by the present land use patterns. They will move the location of their homes relative to where they work, shop, and go for recreation, as a means of modifying their total amount of vehicle use as discussed in Economic Factors. The time scales for these changes is more rapid, with people moving on the average of once every several years. Such changes could affect both the total VMT, as well as the Modes of Transportation discussed in Appendix IIA.

The freeways that provide circulation within the Hyperion Service Area are:

- State Route 2 (Glendale Freeway)
- Interstate 5 (Golden State Freeway)
- State Route 11 (Harbor Freeway)
- Interstate 10 (Santa Monica Freeway)
- Federal Highway 101 (Ventura Freeway)
- State Route 118 (Simi Valley Freeway)
- State Route 134 (Ventura Freeway)
- Interstate 210 (Foothill Freeway)
- Interstate 405 (San Diego Freeway)

Of these, Routes 2, 118, and 210 are incomplete, leaving gaps in the system.

As shown in Figure IX-10, substantial portions of the following freeways are now operating at full capacities so that no increase in peak hour traffic volume can be accommodated without additional freeway or mass transit expansions:

- Highway 5 (Golden State Freeway)
- Highway 101 (Hollywood Freeway)
- Highway 11 (Harbor Freeway)
- Highway 405 (San Diego Freeway)

These crowded freeways could act as a short-term deterrent to residential growth in the San Fernando Valley, although they could actually induce Valley growth by making employment and industry relocation to the Valley more desirable. Unused freeway capacity is found mostly in the eastern part of the basin and in the Valley north of the Santa Monica Mountains.

The freeway holding capacity for the San Fernando Valley is estimated to be 1,440,000 persons, based on the following assumptions:

- The 1974 population of the modeling region was 1,200,000.
- Daily demand out of the Valley is 517,000 vehicle trips per day.
- The P.M. peak hours (4 to 6 P.M.) represent 9 percent of the daily trips.
- Maximum freeway capacity is 2,000 vehicles per lane-hours.
- Fourteen lanes will be available to travel.

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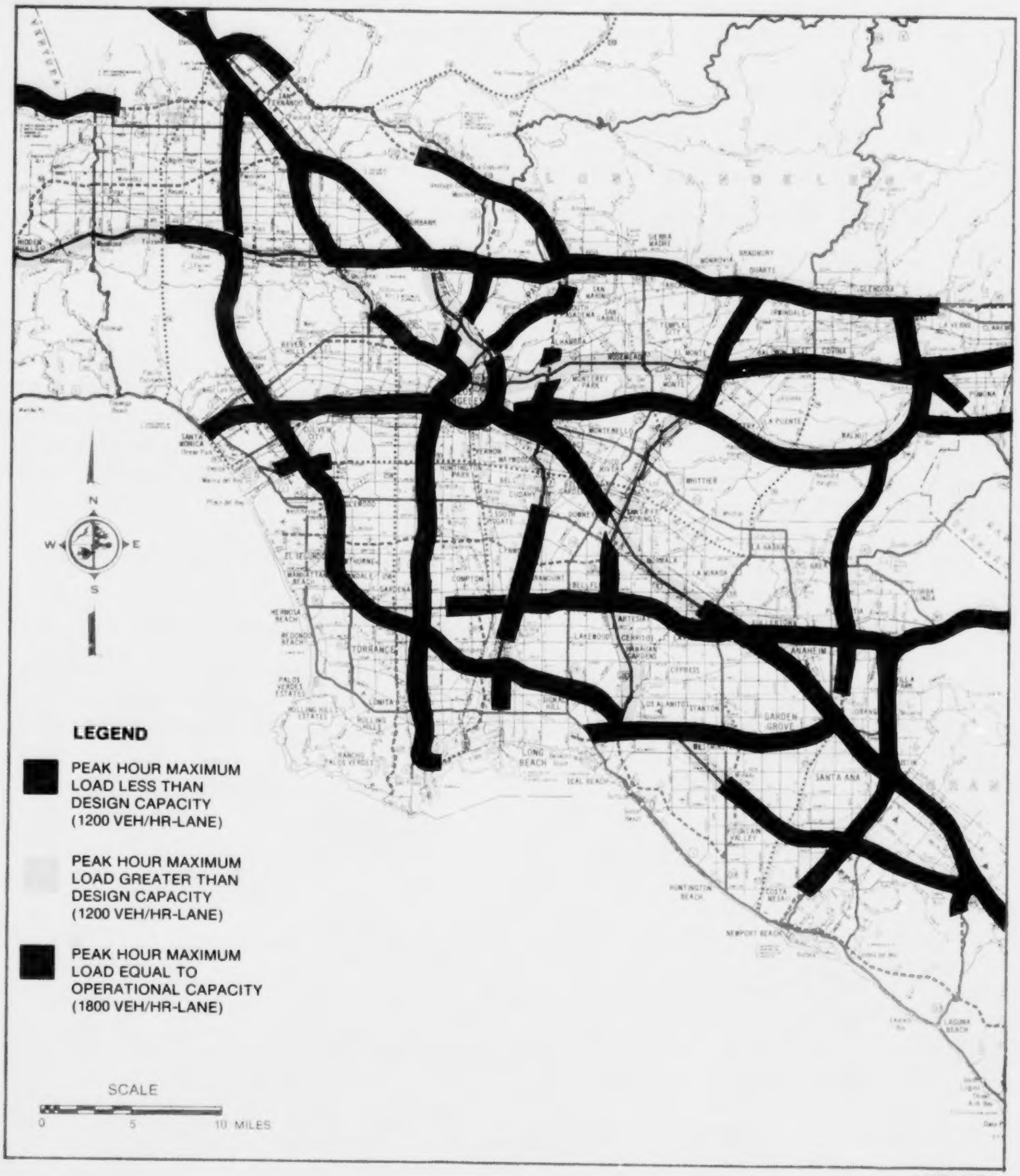
LEGEND
PEAK HOUR MAXIMUM LOAD LESS THAN DESIGN CAPACITY (1200 VEH/HR-LANE)
PEAK HOUR MAXIMUM LOAD GREATER THAN DESIGN CAPACITY (1200 VEH/HR-LANE)
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LONG BEACH
ANAHEIM
SANTA ANA
GARDEN GROVE
COMPTON
WHITTIER
MONTEREY PARK
SIERRA MADRE
PALOS VERDES ESTATES
HUNTINGTON BEACH
NEWPORT BEACH
LAGUNA BEACH

198P-369

Figure IX-10. Peak load capacities of Los Angeles freeway system.

This calculation indicates that the Valley is nearly at the freeway holding capacity. The holding capacity of the Valley based on surface street arterials is estimated to be 2,580,000 or about twice the present population. This is based on the following assumptions:

- 2 principal arterials per mile
- 14 collector streets per mile
- 800 vehicles per lane-hours capacity of arterials
- 200 vehicles per lane-hours capacity of collector streets
- average speed of 30 MPH on arterials and 20 MPH on collectors
- vehicle occupancy of 1.2 persons per vehicle
- a family size of 4 persons per household

However, although the mountain pass streets and freeways from the Valley to the southern part of the City are at maximum vehicle capacity during peak hours, there is additional capacity for people. Additional people could be moved across the mountains any of three ways that don't require expanding roadways:

1. The peak hours could lengthen as people try to get an early start on the rush hours.
2. Vehicle occupancy could increase through carpooling.
3. Increased bus transit could remove vehicles from the highways during the peak hours (see Section II for a discussion of proposed preferential treatment of freeways for buses and carpools).

F. impacts on air quality

IX-75

F. IMPACTS ON AIR QUALITY

1. INTRODUCTION AND MODELING METHOD

To determine the effect of the changing emissions levels of reactive hydrocarbons and oxides of nitrogen on air quality, it was necessary to formulate a model that linked emissions, meteorology, and pollutant concentration. Much effort and time has been spent in this formulation by many investigators (Ball, 1973). Results have been mixed with no model being generally accepted or readily adaptable to the present subregional analysis goals.

The essential elements of any air quality model are source emissions data, meteorological inputs characterizing transport and diffusion processes, and information concerning chemical transformations and removal processes. The type of air quality model, as well as its spatial and temporal characteristics, are dictated by the purpose for which the model is being employed. Ordinarily, a model is used to determine if airborne pollutant concentrations corresponding to prescribed emission conditions will meet ambient air quality standards. Atmospheric emissions/air quality models are still evolving, especially in the area of relating O_x formation to emissions of RHC and NO_x precursors. Mathematical models have been proposed with various degrees of sophistication. Volume 12 of the EPA Guidelines (EPA, 1974) summarizes the current status of most commonly used models in terms of pollutants, time frame of averaging, ease of use, applicability, and reliability (i.e., accuracy). None of these models is particularly designed to provide the kind of information desired for the present evaluation. The relative distribution rather than the photochemistry of pollutants is needed.

In order to resolve this difficulty, an air pollution model based on early work by Hanna and Gifford (Gifford and Hanna, 1970; Hanna, 1971), combined with an empirical aerometric model developed for Los Angeles by Chevron Research (Mertz, Painter, and Ryason, 1975) and using a basinwide wind transport scheme, was synthesized for this study (see Appendix IIB for details).

The benefits of using the simplified model approach, when a reasonable validation can be demonstrated, are that such a model is relatively inexpensive to use, it can be modified easily, it includes meteorology and changes in the meteorology, emissions nodules can be made independently of each other, the area over which the model can be applied is variable as desired from one 10 km square to the South Coast Air Basin,

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the model output location detail is controlled by either the input resolution of the wind field or the emissions inventory, whichever is more general, and finally, the model parameters can be readily normalized to reflect area or basinwide criteria as desired.

Two comments on the model input data are pertinent. The average hourly vehicle emissions data (computed by dividing daily averages by 24) were increased by about 40 percent to account for traffic peaks, and the fact that for the time span of the validation (10 hours or 42 percent of a day), on the average, 50 percent of the vehicle miles are traveled in the City.

A second data modification was performed on the total mobile and stationary hydrocarbon concentrations computed by the model for the overall 10-hour period of the model run. The concentrations were multipled by a factor of 7 to convert from ppm of individual hydrocarbons to the ppm C (parts per million carbon) values required for entry into the empirical model developed by Chevron Research (Mertz, Painter, and Hyason, 1972). The element in the model in which these changes are incorporated is the term that converts emissions levels to concentration values:

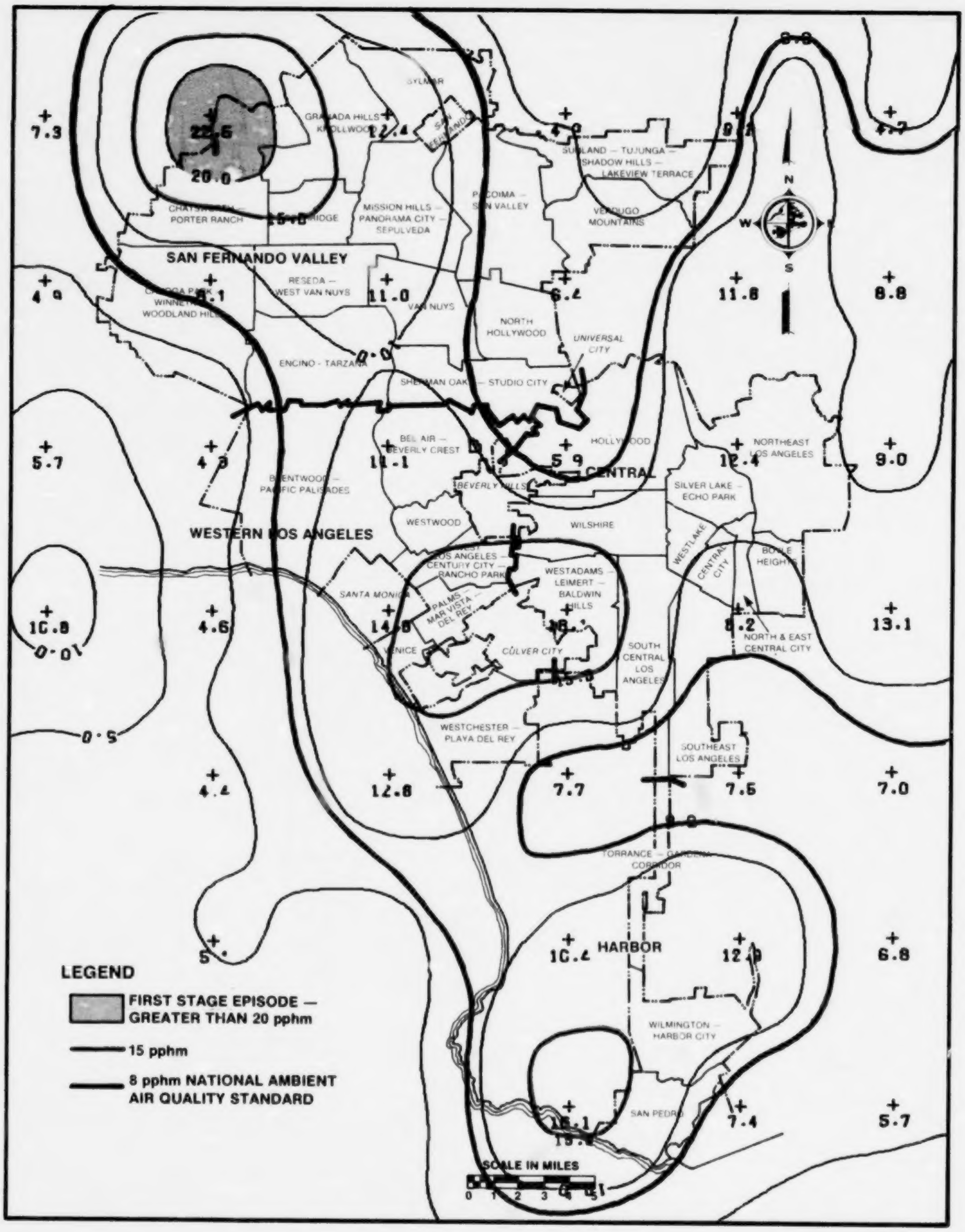
$$\text{Concentration (RHC)} = \text{Constant} \times \frac{\text{Tons Per Hour Emitted}}{\text{Hourly Windspeed}}$$

The mobile tons per hour value of reactive hydrocarbon emissions completed by the traffic mode was multiplied by 1.4, added to the stationary emissions, and the total multiplied by 7.0. The resulting emission value was then entered into the RHC term of the model as described in Appendix IIB.

Using the projected emissions levels for 1990, the model produced the air quality map shown in Figure IX-11. Total emissions are lower than in 1974, so the overall oxidant levels have decreased somewhat. For the Hyperion Service Area, the maximum oxidant levels would generally still be expected to exceed 8 pphm. About 60 percent of the total service area would be expected to have values over 8 pphm on a typical smoggy day with about 20 percent of the area having 15 pphm or higher.

The model does not compute the highest possible maxima for oxidant, since the input consists of a given set of average estimated hydrocarbon and nitrogen oxides emissions (such as the 1990 projections). In addition, the meteorology, as represented by the wind field, was chosen on a day that showed high (but not necessarily the highest) oxidant levels possible. It is conceivable and entirely possible that some other set of conditions would have resulted in higher values. The conditions on September 25, 1975, are more representative of median smog days than extreme maxima.

A contour map of oxidant levels for a 90 percent reduction in overall emissions from the 1974 inventory is shown in Figure IX-12. This model was done to estimate the effect of a large emissions change, since at present, such a decrease seems to be required to ensure meeting the NAAWS of 8 pphm throughout the basin. The figure shows that in most areas of the City, the required levels could be met for such a tremendous emissions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SAN FERNANDO
SUNLAND – TUJUNGA – SHADOW HILLS – LAKEVIEW TERRACE
CHATSWORTH – PORTER RANCH
NORTHRIDGE
MISSION HILLS – PANORAMA CITY – SEPULVEDA
PACOIMA – SUN VALLEY
VERDUGO MOUNTAINS
CANOGA PARK – WINNETKA – WOODLAND HILLS
RESEDA – WEST VAN NUYS
VAN NUYS
NORTH HOLLYWOOD
UNIVERSAL CITY
ENCINO – TARZANA
SHERMAN OAKS – STUDIO CITY
BEL AIR – BEVERLY CREST
HOLLYWOOD
NORTHEAST LOS ANGELES
BRENTWOOD – PACIFIC PALISADES
BEVERLY HILLS
SILVER LAKE – ECHO PARK
WESTWOOD
WILSHIRE
WEST LOS ANGELES – CENTURY CITY – RANCHO PARK
WESTADAMS – LEIMERT – BALDWIN HILLS
WESTLAKE
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BOYLE HEIGHTS
SANTA MONICA
PALMS – MAR VISTA – DEL REY
VENICE
CULVER CITY
SOUTH CENTRAL LOS ANGELES
NORTH & EAST CENTRAL CITY
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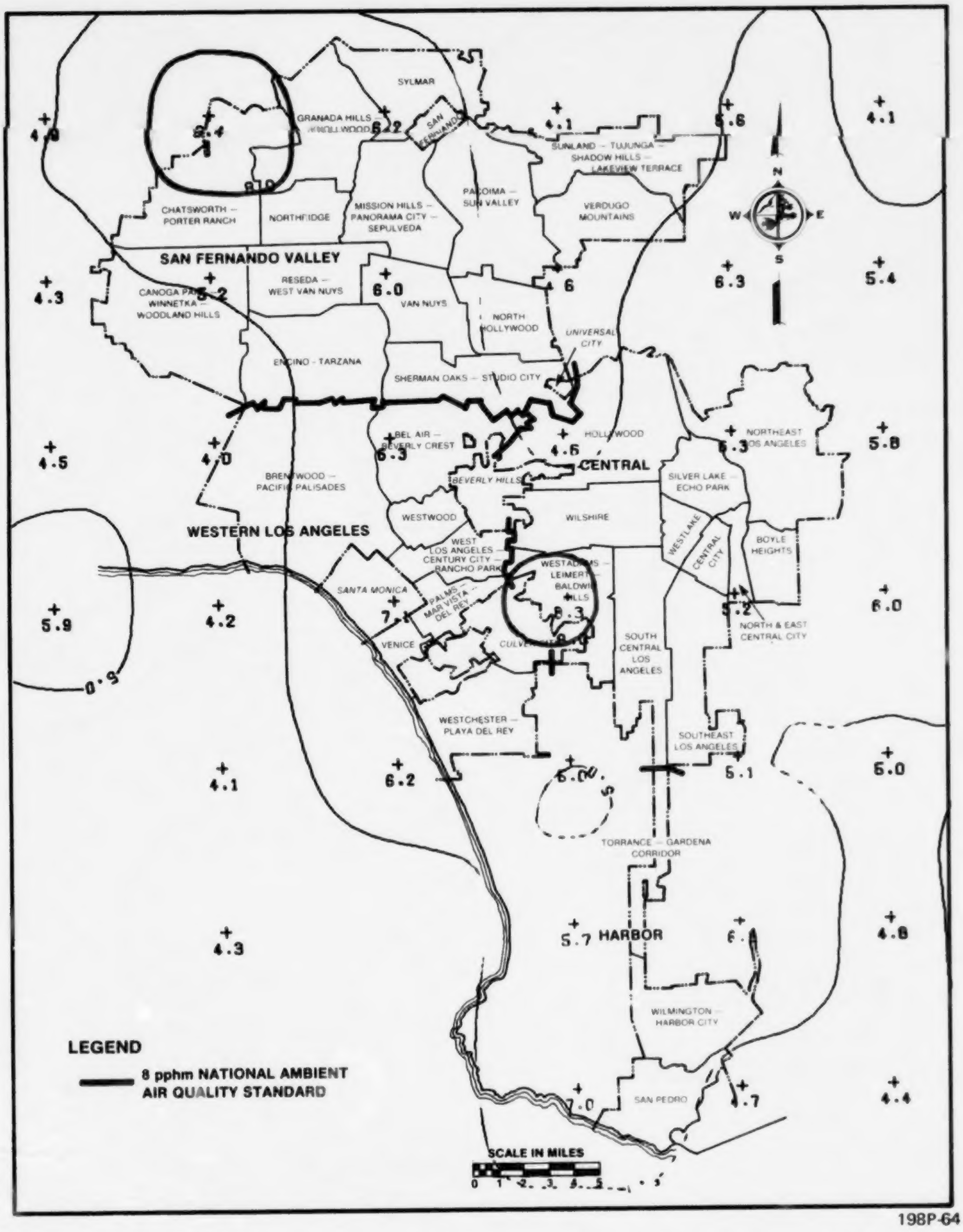
8 pphm NATIONAL AMBIENT AIR QUALITY STANDARD

198P–65

Figure IX-11. 1990 projected air quality for a typical smog day under the SCAG-76 population growth policy.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PACOIMA – SUN VALLEY
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8 pphm NATIONAL AMBIENT AIR QUALITY STANDARD
SCALE IN MILES
0 1 2 3 4 5
198P-64

Figure IX-12. Estimated 1990 air quality for emissions levels that are reduced by 90 percent from the 1974 base.

cutback. Some areas of the western San Fernando Valley and a small portion of the central City would be expected to have values between 8 and 10 pphm.

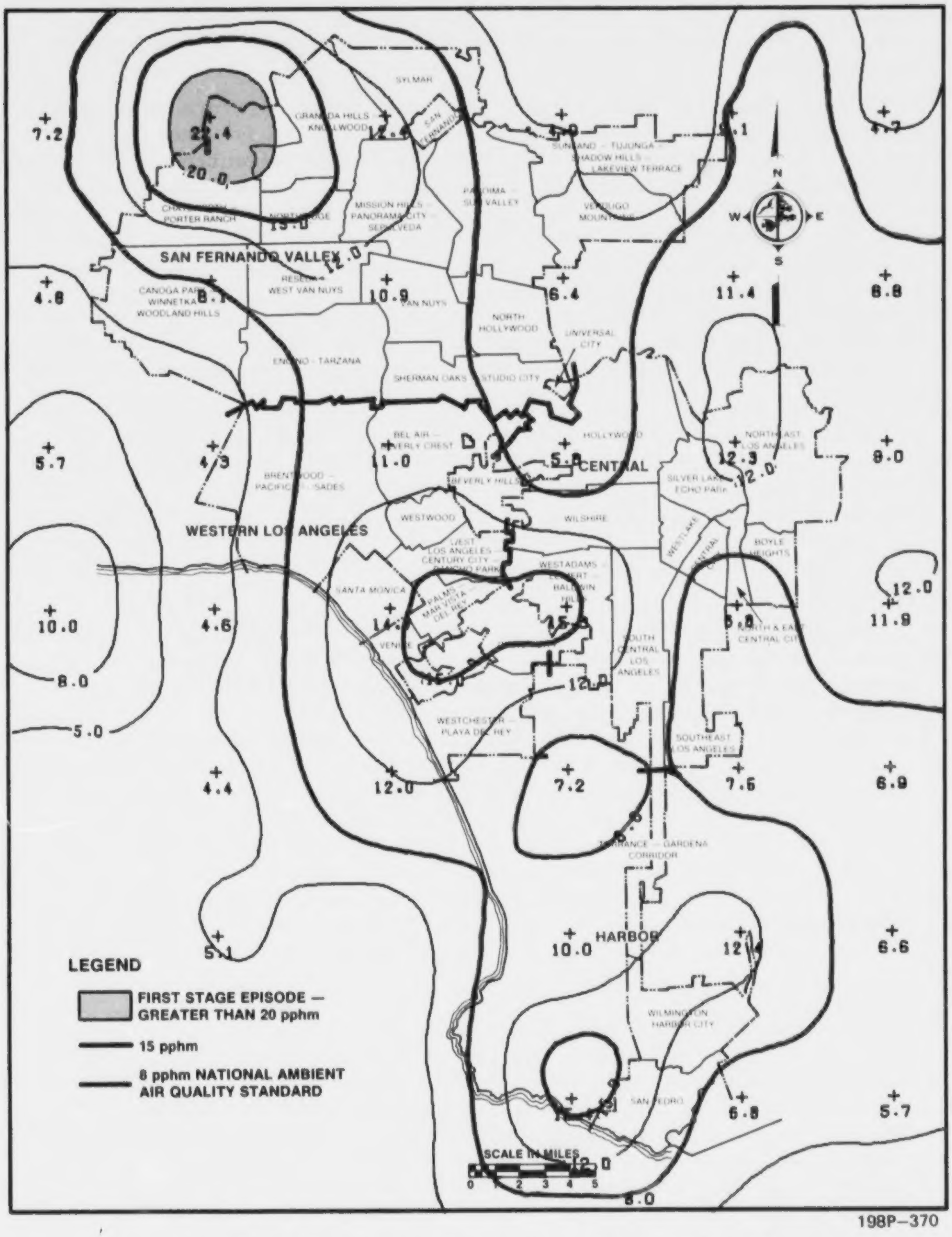
A less dramatic, and probably more realistic, picture is shown in Figure IX-13, where the 1990 NO_x and RHC emissions have been decreased 25 and 40 percent respectively in the Boyle Heights/Central City/Southeast Los Angeles area. The model indicates that the 8 pphm limit would still be exceeded in most of the other metropolitan areas, but small improvements in air quality are seen in widely scattered parts of the City as the result of emission decreases in one area. In Baldwin Hills, the expected oxidant level drops from 18.1 pphm to 15.3 pphm, a 15 percent improvement. In San Pedro, a 4 percent improvement is seen compared to the SCAG-76 baseline. In addition, areas as far away as Beverly Hills and Glendale show small but detectable improvements (compare Figure IX-12 and IX-13).

Under a scenario that would permit no growth in population within the Hyperion Service Area, a 40 TPD (12 percent) reduction in reactive hydrocarbon emissions and a 38 TPD (14 percent) reduction in nitrogen oxides would occur within Los Angeles. The resultant oxidant distribution is shown in Figure IX-14. Although the highest oxidant values are reduced from those in Figure IX-11, oxidant levels still exceed 8 pphm throughout most of the City.

Table IX-27 shows the effect of this possible emission control effort in detail. The percent reduction in maximum oxidant level range from 3 percent in Glendale to a maximum of nearly 12 percent in Hawthorne. The service area average oxidant air quality remains worse than desired (10.7 pphm vs. 8 pphm), and the low potential for improvement based on a significant population restriction can be seen. The largest percentage changes in oxidant maximum occur in Hawthorne and Santa Monica with the smallest improvement occurring in Glendale and Burbank. From a comparison with Figure IX-12, it can be seen that the largest improvement occurs near the location of the highest oxidant maximum (West Los Angeles). This is the same effect as seen in the "roll back" emissions control approach, modified here by the air quality model output which is more representative than the usual "roll back" relationship.

2. EMISSIONS ANALYSIS

One of the key factors in emissions analysis for the South Coast Air Basin in general and the Los Angeles City Hyperion Service Area in particular is the population distribution. Determination of the level of population (in absolute numbers) and the various ways in which it is distributed must be established prior to defining the air quality baseline and/or subsequent impacts. The controlling influence in establishing the emissions level associated with each population scenario is the automobile usage (i.e., vehicle miles traveled) for each distribution pattern. Stationary emission sources are generally related to the population pattern, and tend to increase as population levels go up.


SAN FERNANDO VALLEY
WESTERN LOS ANGELES
CENTRAL
HARBOR
SYLMAR
GRANADA HILLS – KNOLLWOOD
SAN FERNANDO
SUNLAND – TUJUNGA – SHADOW HILLS – LAKEVIEW TERRACE
CHATSWORTH – PORTER RANCH
NORTHRIDGE
MISSION HILLS – PANORAMA CITY – SEPULVEDA
PACOIMA – SUN VALLEY
VERDUGO MOUNTAINS
CANOGA PARK – WINNETKA – WOODLAND HILLS
RESEDA – WEST VAN NUYS
VAN NUYS
NORTH HOLLYWOOD
UNIVERSAL CITY
ENCINO – TARZANA
SHERMAN OAKS – STUDIO CITY
BEL AIR – BEVERLY CREST
HOLLYWOOD
NORTHEAST LOS ANGELES
BRENTWOOD – PACIFIC PALISADES
BEVERLY HILLS
SILVER LAKE – ECHO PARK
WESTWOOD
WILSHIRE
WESTLAKE
CENTRAL
BOYLE HEIGHTS
WEST LOS ANGELES – CENTURY CITY – RANCHO PARK
WEST ADAMS – BALDWIN HILLS
SANTA MONICA
PALMS – MAR VISTA – DEL REY
VENICE
SOUTH CENTRAL LOS ANGELES
SOUTH & EAST CENTRAL CITY
WESTCHESTER – PLAYA DEL REY
SOUTHEAST LOS ANGELES
TORRANCE – GARDENA CORRIDOR
WILMINGTON – HARBOR CITY
SAN PEDRO
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SCALE IN MILES
0 1 2 3 4 5
LEGEND
FIRST STAGE EPISODE — GREATER THAN 20 pphm
15 pphm
8 pphm NATIONAL AMBIENT AIR QUALITY STANDARD

198P–370

Figure IX-13. Oxidant levels projected for 1990 with emissions reductions limited to the central City.

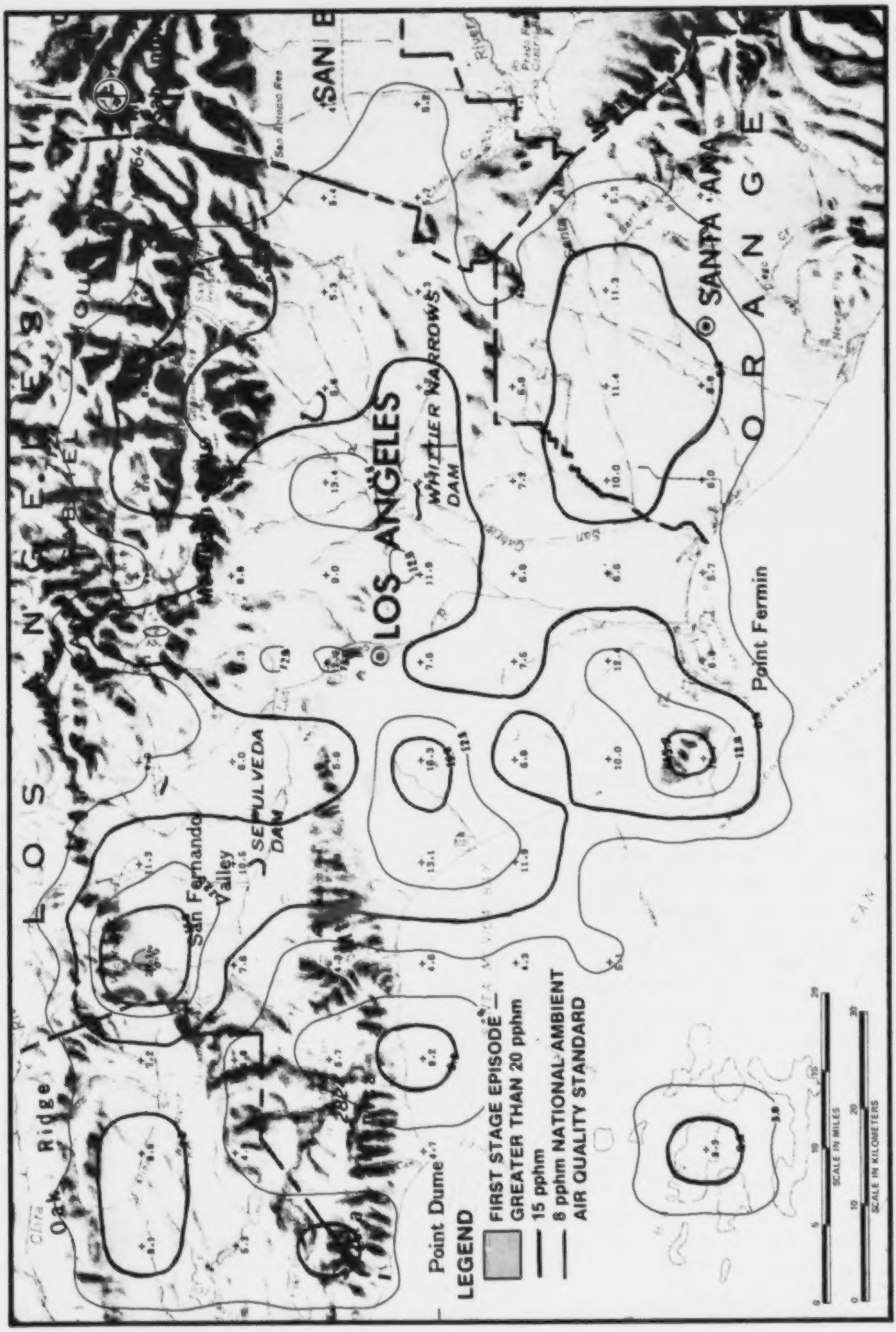

LOS ANGELES
ORANGE
SAN B
Oak Ridge
Point Dume
San Fernando Valley
SEPULVEDA DAM
LOS ANGELES
WHITTIER NARROWS DAM
Point Fermin
SANTA ANA
San Antonio Res
LEGEND
FIRST STAGE EPISODE — GREATER THAN 20 pphm
15 pphm
8 pphm NATIONAL AMBIENT AIR QUALITY STANDARD
SCALE IN MILES
SCALE IN KILOMETERS
198P-63

Figure IX-14. Oxidant distribution for no population growth in the service area from 1974 to 1990.

Table IX-27. Maximum 1990 oxidant levels (pphm).

Zone	Name	SCAG '76	Hyperion No Growth (12% RHC Reduction) (14% NOx Reduction)	% Reduction in Oxidant
-11	Hawthorne	7.7	6.8	11.7
-16	Santa Monica	14.8	13.1	11.5
-17	Culver City	18.0	16.3	9.4
-18	Downtown L. A.	8.2	7.6	7.3
23	Sherman Oaks	11.1	9.9	10.8
-24	W. Hollywood	5.9	5.6	5.1
-25	Glendale	12.4	12.0	3.2
30	Tarzana	8.1	7.6	6.2
31	Sepulveda	11.0	10.5	4.5
32	Burbank	6.2	6.0	3.2
33	La Crescenta	11.8	11.3	4.2
35W	Chatsworth	22.5	20.5	8.9
35E	San Fernando	12.4	11.3	8.9
	Average	11.5	10.7	7.0

Where vehicle emission controls are expected to decrease the amount of pollutant from individual vehicles up to an expected maximum effectiveness in the 1985 to 1987 time period, stationary emissions are not being reduced but are increasing. Stationary hydrocarbon emissions in the South Coast Air Basin are expected to increase from 610 TPD in 1974 to 800 TPD by 1990, a 30 percent increase, while the population increases only 17 percent in the same time frame. Stationary source NO_x emissions increase about 40 percent by 1990 and carbon monoxide emissions go up by 65 percent, due mostly to expected increases in industrial emissions.

A selected group of emissions scenarios was then converted to air quality, using the model developed for use in the Los Angeles area. Since the model input was emissions by zone, identified for both stationary and mobile sources, changes in air quality were developed for a variety of zonal configurations. The traffic related mobile emissions do reflect the population distribution patterns directly in these scenarios. The details of the transportation and air quality models are contained in Appendices IIA and IIB respectively.

3. STATIONARY EMISSIONS

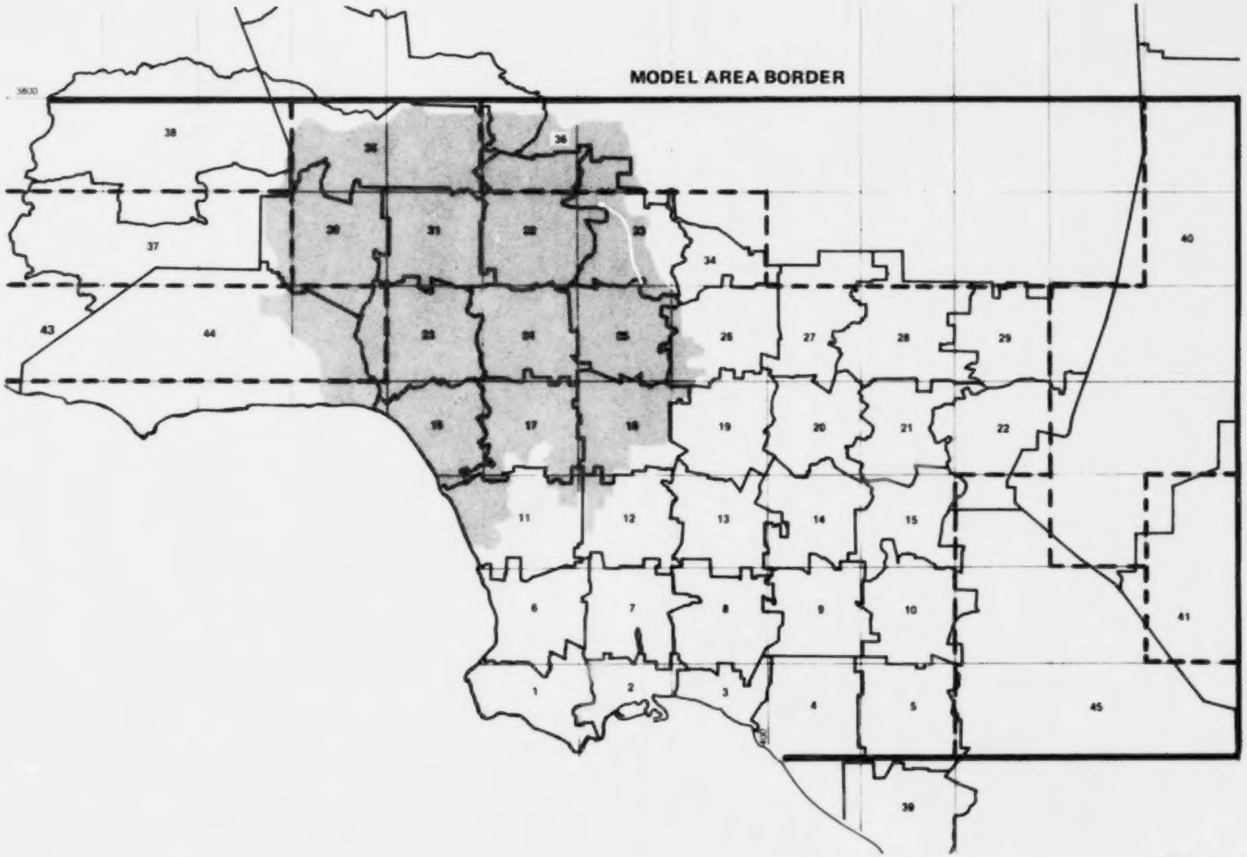
The population data used in conjunction with stationary source inventories is the same as that used in the vehicle emissions model. The 45 zones identified for use in the analysis are shown in Figure IX-15. Zone 11 has been partitioned so that the total population assigned to the Hyperion Service Area is the same as that developed by the Facilities Plan (3,053,429). The zone approximation to the service area (outlined in Figure IX-15) used in this analysis standardizes the data so that the mobile and stationary analyses could be meshed. The specific zones used to represent the service area are given with their 1974 and 1990 populations (as projected by SCAG-76) in Appendix IIB.

Air quality impacts are based on future emission characteristics and their spatial and temporal character so that projecting emissions rates for future years is a necessary first step. Several attempts have been made to do this for the South Coast Air Basin. One of the more complete studies was done by the RAND Corporation (Mikolowsky et al., 1974) for the Southern California Association of Governments. Mokolowsky points out two major problems with any projection scheme. One is the extensive data needed to define the initial baseline, and the other is the multitude of assumptions and approximations associated with forecasting regional emissions through a desired target date. Neither problem lends itself to ready solution, but efforts to improve measurement data and refine, or at least standardize, projection information have been made. The California Air Resources Board has developed a preliminary update of the 1974 base year emissions inventory (ARB, 1975) and a revised hydrocarbon reactivity determination (ARB, 1976). We have used these as the baseline for the projections of stationary emissions for the present study. Comparison with the most recent study (AQMP, 1976) is shown in Figure IX-16, where the ARB and AQMP data for selected emissions are plotted in tons per day for the years 1975 through 1995. The composite emissions figures developed for this study are shown for the 1974 base year and for 1990. Percentage changes in the emissions from 1974 through 1990 are given in Table IX-28 for the ARB, AQMP, and HDR data.

Examination of the ARB projected stationary emissions, as shown in Figure IX-17 for 1990, shows that the service area is a relatively high emitter of reactive hydrocarbons. The 339 tons per day (TPD) of reactive hydrocarbons emitted in 1990 represents 30 percent of the basinwide stationary emissions (about 18 percent above the basin per capita average). For oxides of nitrogen, on the other hand, the 67 TPD emitted from stationary sources in 1990 is about 19 percent of the basinwide stationary emissions of NO_x (about 30 percent below the overall basin per capita average).

4. COMPARISON OF STATIONARY AND MOBILE EMISSIONS

Comparisons of stationary and mobile emissions for the South Coast Air Basin (SCAB) are shown graphically in Figure IX-13. Service area


MODEL AREA BORDER
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39

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Figure IX-15. Modified 45 zone air quality region showing the area and zoning used in developing the aerometric model. Dashed lines show internal 10 km square aggregation and the Hyperion Service Area is shown in grey. Zone numbers correspond to those in Tables B and C of Appendix IIB.

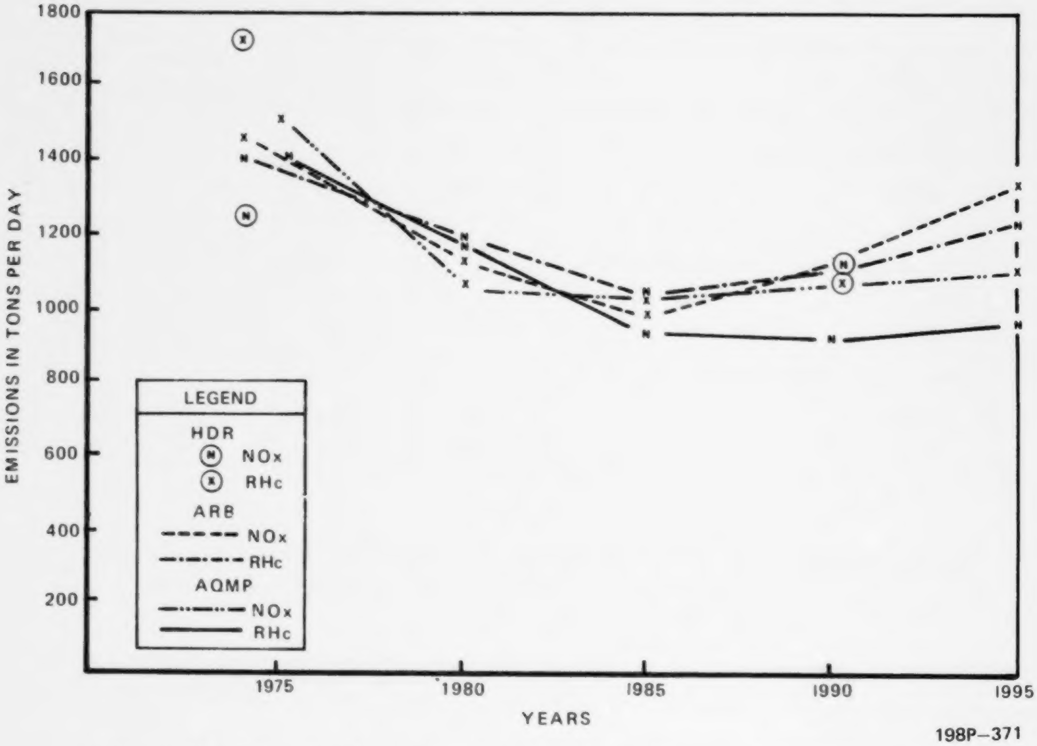

Figure IX-16. Projected emissions levels of nitrogen oxides and reactive hydrocarbons for the South Coast Air Basin.

emissions for the year 1990 are shown in Table IX-29. For 1990, the stationary and mobile hydrocarbons and oxides of nitrogen emissions contributed by the expected population growth under SCAG-76 policies in the grid zones in the regional core (11, 16, 17, 18, 24, and 25) are 65 percent of the service area mobile emissions of RHC and NO_x. The same six zones contribute 62 percent of the stationary RHC emissions and 58 percent of the NO_x emissions from the service area. The relative importance of surface traffic, freeway traffic, and stationary sources of reactive hydrocarbons and oxides of nitrogen can be seen in Figure IX-17. The significant change in proportion of the mobile and stationary sources from 1974 to 1990 is evident. Traffic emissions decrease from 65 percent of the total reactive hydrocarbons in 1974 to 28 percent for the SCAB in 1990 under the present population and control technology extrapolations. Stationary emissions of reactive hydrocarbons therefore increase from 36 percent to over 75 percent of the total. SCAB stationary source nitrogen oxides increase from 34 to 54 percent of total NO_x emissions. These

Table IX-28. Projected emissions changes for the South Coast Air Basin (SCAB).

	1974	1990	PERCENT REDUCTION
Air Resources Board			
RHC	1,486	1,138	23
NO_x	1,497	1,117	23
Air Quality Maintenance Plan			
RHC	1,512	1,088	28
NO_x	1,427	918	36
HDR Analysis			
RHC	1,731	1,090	37
NO_x	1,254	1,132	10

Table IX-29. 1990 service areas emissions by zone for SCAG-76 population and HDR traffic projection in tons per day.

	ZONE	POPULATION	MOBILE RHC	STA. RHC	MOBILE NO_x	STA. NO_x
Hawthorne	11	132,063	7.6	33.	14.3	3.2
Santa Monica	16	341,982	6.2	23.7	11.3	5.1
Culver City	17	431,994	8.6	23.3	15.5	2.8
Downtown LA	18	421,872	13.1	43.1	22.9	11.9
Sherman Oaks	23	110,445	3.8	4.7	6.4	1.1
W. Hollywood	24	293,032	6.2	9.5	11.4	2.5
Glendale	25	313,411	7.7	17.9	13.5	6.7
Tarzana	30	311,920	4.6	14.6	9.0	2.1
Sepulveda	31	280,600	6.7	23.3	12.0	8.4
Burbank	32	247,395	6.4	17.4	11.4	18.7
La Crescenta	33	136,635	2.6	8.2	4.7	1.7
Chatsworth—SF	35	226,876	5.2	20.5	10.2	2.4
Total		3,248,225	78.7	239.	142.6	66.6

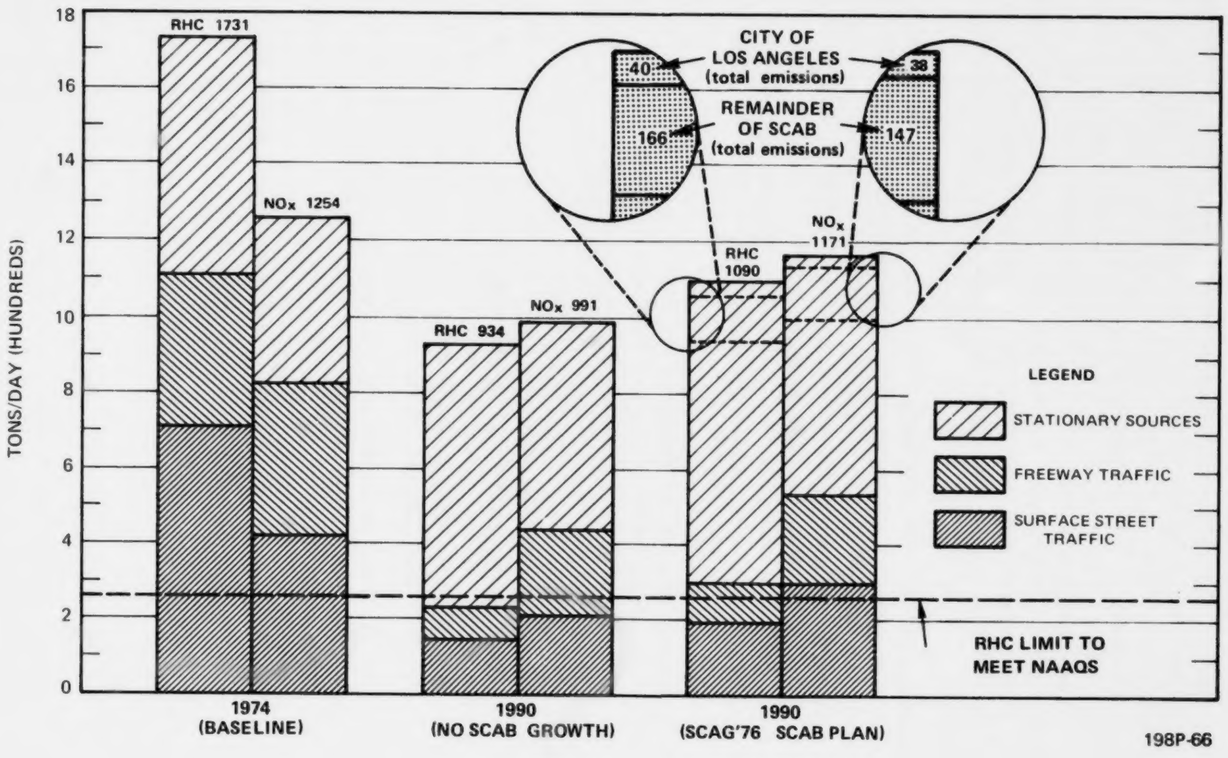

Figure IX-17. ARB projected emissions for South Coast Air Basin (SCAB).

trends indicate that future emissions reductions would be more effectively aimed at stationary rather than mobile sources.

The "no-growth in the South Coast Air Basin" scenario shown in Figure IX-17 assumes that the entire south coast population level does not change from 1974 to 1990. The per capita generation rate for emissions, however, changes at the presently projected rates. The emissions for this no-growth scenario show a 17.5 percent reduction in overall reactive hydrocarbon emissions and a 13.2 percent reduction in oxides of nitrogen compared to presently projected 1990 values. Even under this scenario, the hydrocarbon level is still about 3-1/2 times as high as the estimated 256 TPD limit required to meet national ambient air quality standards.

The difference in NO_x and hydrocarbon emissions between the service area scenario for no-growth in population (essentially no growth in Los Angeles) and the SCAG-76 policy in 1990 can be seen in Figure IX-18. The difference between the two scenarios is 40 TPD for reactive hydrocarbons and 38 TPD for oxides of nitrogen. These figures reflect roughly 12 percent and 14 percent reductions in total reactive hydrocarbon emissions and nitrogen oxide emissions respectively for the service area compared to the SCAG-76 projections.

The stationary emissions categories of sources within the South Coast Air Basin that contribute the reactive hydrocarbons and oxides of nitrogen are in the emissions inventory developed by the State of California (ARB, 1975), and are depicted in Figure IX-19. The column divisions represent the differing source contributions. For example, relatively few reactive hydrocarbons are emitted by the fuel combustion processes, which are heavy contributors to the oxides of nitrogen emissions load. Conversely, solvent users and petroleum marketing operations are projected to contribute about 30 percent of the reactive hydrocarbons and essentially none of the oxides of nitrogen by 1990.

The percentage changes in reactive hydrocarbons from 1974 to 1990 for a given category of emissions show that the surface coating or painting category is projected to grow by about 80 percent. The petroleum marketing category shows a projected 60 percent decrease in reactive hydrocarbon emissions from 1974 to 1990. Petroleum refining shows a 70 percent increase, and solvent users are projected to increase emissions by 50 percent. With increases expected in these areas and generally decreasing automotive emissions, the potential for improving reactive hydrocarbon emissions control by controlling specific stationary sources is obvious.

Oxides of nitrogen emissions are mostly associated with fuel combustion in power plants. Although controls have been imposed on stationary sources for particulate and sulfur dioxide emissions for quite some time (Los Angeles, Orange, San Bernardino, and Riverside rules and regulations), less attention has been paid to further reducing the oxides of nitrogen.

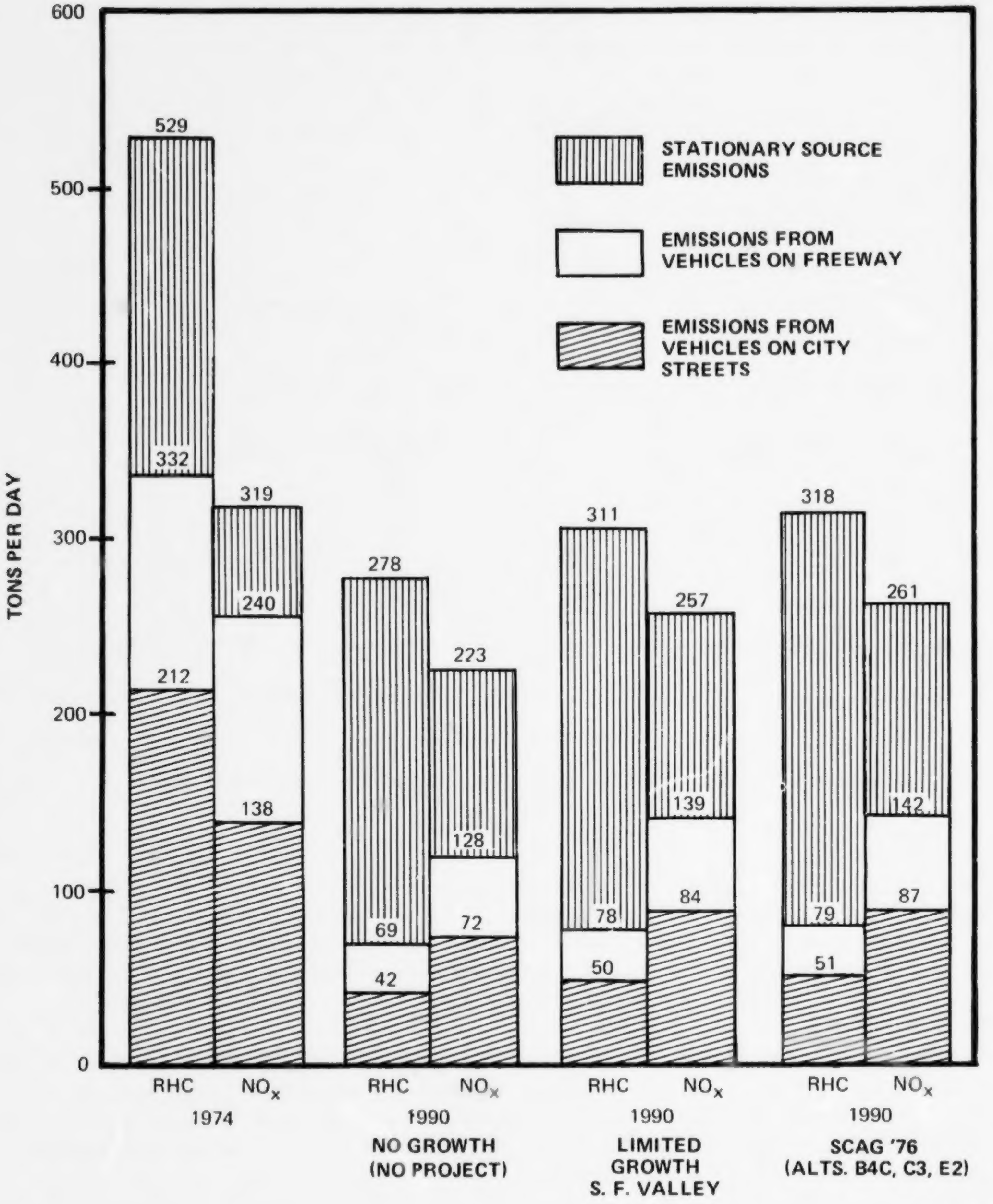

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Figure IX-18. Hyperion Service Area emissions for 1974, no project, and various project alternatives.

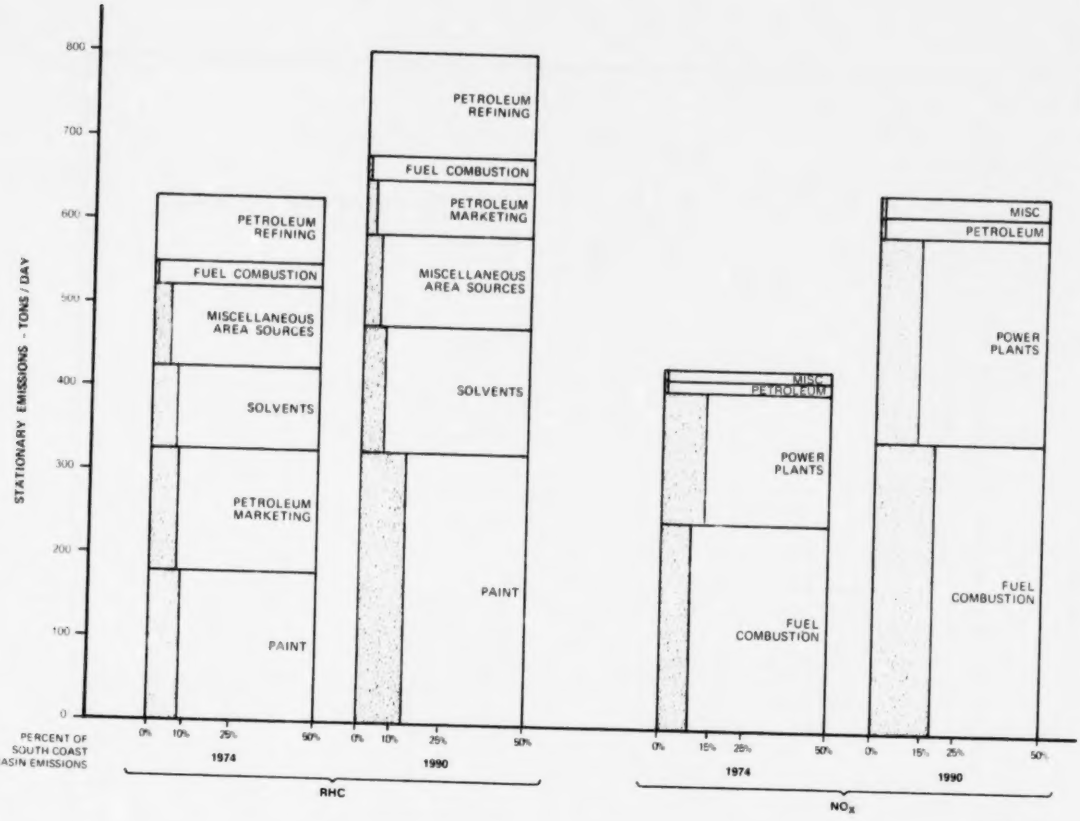

Figure IX-19. Stationary emissions inventory for 1974 and 1990 (ARB 1975 data).

Power plants are probably more susceptible to control than are the miscellaneous fuel combustion processes, but both appear to be valid areas for exploration. Along the left-hand edge of the columns in Figure IX-19 appears an area that represents, for each emissions category, that portion of the South Coast Air Basin emissions load generated in the Hyperion Service Area.

By 1990, about 13 percent of the stationary source hydrocarbons is projected to be caused by the use of paints or surface coatings of various kinds in the City. Solvent uses and miscellaneous sources, including petroleum handling, add another 15 percent. Such sources are probably targets for effective source control efforts.

About 18 percent of the stationary source nitrogen oxides for the entire basin are projected to come from fuel combustion (other than in power plants) within the City of Los Angeles by 1990. Power plants are projected to contribute about 14 percent of the basin total.

The service area in 1990 with SCAG-76 growth will contribute a total of 318 tons per day of mobile and stationary reactive hydrocarbons or 29 percent of the South Coast Air Basin total. Total nitrogen oxides from mobile and stationary sources within the service area are expected to be about 261 tons per day or 22 percent of the South Coast Air Basin total in 1990.

5. EXPOSURE INDICES

The area representations of air quality can be converted to estimates of the number of days that a specified limit will be exceeded by using an approach developed by Larsen (Larsen, 1971). In this approach, a linearization is performed on the distribution of daily maximum oxidant values by using the natural logarithm of the daily maxima. A plot of this logarithm versus the percent frequency of occurrence is a straight line (Figure IX-20). As an estimate, we can assume that these linearized distributions are similar for locations of interest within the South Coast Air Basin. Using a baseline distribution derived from 1974 data and an extrapolated frequency of occurrence for extreme oxidant maxima of 11 days per year, we can plot the graph in Figure IX-20. For each station, the distribution line passes through a projected maximum oxidant value that is assumed to occur 11 days per year, and is parallel to the baseline distribution. From such a graph, values of expected maxima for other occurrence frequencies can be read. Expected frequencies for specified oxidant levels can be read as well for any location having usable oxidant data. Three typical stations, Granada Hills, Long Beach, and downtown Los Angeles, are shown.

Table IX-30 shows the estimated number of days over established standards for three representative locations within the service area. The baseline values are given for our model results for 1974 and 1990. Theoretical emission reduction percentages for a selected set of scenarios in 1990 were computed and the resulting number of days also tabulated.

Comparison with the 1974 observed frequencies of occurrence of days over the 8, 20, and 35 pphm limits (line 2 of the table) shows that this frequency model tends to over-predict the frequency of events in the neighborhood of 8 pphm and 35 pphm and under-predict those near the 20 pphm limit, but overall, its performance appears reasonable. The under-prediction tendency of the model is caused by the nonlinearity in the real world of the logarithm of the maximum oxidant, which has definite curvature between 15 pphm and 30 pphm. Relative merit for each scenario is indicated by the number of days exceeding standards shown in Table IX-30.

Table IX-31 shows similar information for 8 and 20 pphm in terms of the regional population exposure limit (RPEL) index developed by RAND (Mikolowsky et al., 1974). The representativeness of this index is enhanced by including an estimate of the number of people affected for the number of days standards are exceeded. The population figures of three zones (10 km grid squares) within the service area were selected as indicators: Granada Hills (zone 35, population 226,876); Burbank-North Hollywood

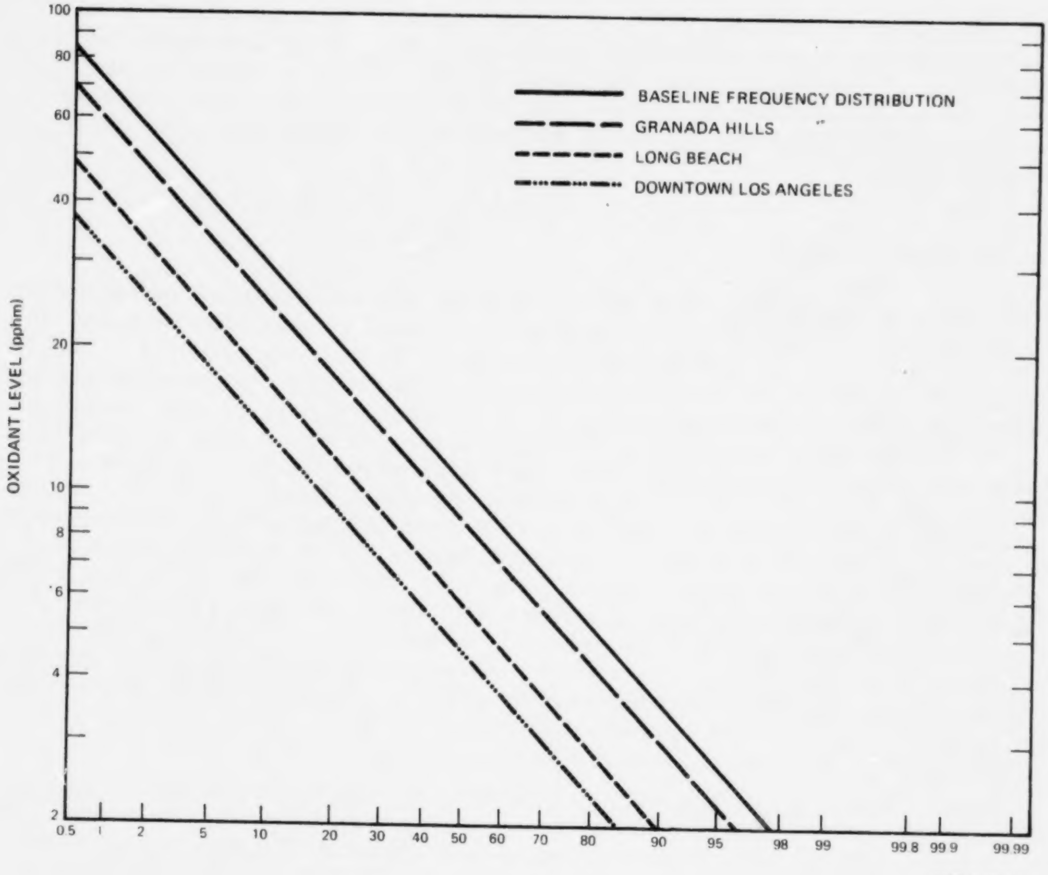

Figure IX-20. Frequency of occurrence oxidant levels for Granada Hills, Long Beach, and downtown Los Angeles.

(zones 31 and 32, population 527, 995); West Los Angeles-Culver City (zone 17, population 431,994).

The no-growth scenario shows an index of 5,444 x 10^6 ppmd (people parts per million days). In this system, the no-growth and the 30 percent basinwide reduction in reactive hydrocarbon emissions result in the same improvement within a few percentage points when compared to the 1990 SCAG-76 baseline.

From the comparisons in these two tables, it is apparent that emissions control efforts in 1990 must include active mitigation. Mitigation efforts should be aimed at significant emissions reductions in specific areas of the SCAB. The service area, for example, contains many industrial

Table IX-30. Number of days standards would be exceeded in the South Coast Air Basin for specified emissions control scenarios.

SCENARIO	8 PPHM[1]			20 PPHM[2]			35 PPHM[3]		
	GRANADA HILLS	BURBANK-NO HOLLYWOOD	WEST LA-CULVER CITY	GRANADA HILLS	BURBANK-NO HOLLYWOOD	WEST LA-CULVER CITY	GRANADA HILLS	BURBANK-NO HOLLYWOOD	WEST LA-CULVER CITY
Model Base	290	104	219	44	9	27	9	1	4
Observed-1974	215	215	215	89	89	89	3	3	3
Baseline-1990	164	22	104	18	1	8	3	3	3
Population Growth in the Service Area	126	11	77	11	1	5	2	1	1

[1] NAAQS.

[2] First stage episode.

[3] Second stage episode.

Table IX-31. Regional population exposure levels in units of 10^6 people parts per million days and percentage of baseline.

SCENARIO	8 PPHM			20 PPHM		
	RPEL	PERCENT OF BASELINE		RPEL	PERCENT OF BASELINE	
		1974	1990		1974	1990
1974 Base	17.206	100	—	5.280	100	—
1990 Base	7.508	—	100	1.613	—	100
90 Percent SCAB Emissions Reduction from 1974	0.766	5	10	0.236	5	15
30 Percent Reduction in SCAB RHC from Projected 1990 Levels	5.420	—	72	0.900	—	56
No Population Growth in the SCAB	5.444	32	73	0.821	16	51

emission sources, a large population, and a freeway system that all contribute to basinwide air pollution problems. Specific mitigation measures for each of these major emissions groups can be implemented.

6. SUMMARY OF MITIGATION REQUIRED

All of the emission projections were prepared for the year 1990. If it is assumed that the relationship between total population and total service area emissions is the same for 2000 as for 1990, emission projections can be made for the entire Facilities Planning period. Table IX-32 shows these emission figures. The increase in emissions with SCAG-76 growth over the projected growth condition is considered to be the project impact requiring mitigation.

Table IX-32. Emissions levels in service area requiring mitigation.

	RHC	NO_x
No Growth, Emissions, 1990 or 2000 (TPD)	278	223
SCAG-76 Growth, Emissions for 1990 (TPD)	318	261
SCAG-76 Growth, Emissions for 2000 (TPD)[1]	329	270
Increase of SCAG 1990 over No Growth	40 TPD 14%	38 TPD 17%
Increase of SCAG 2000 over No Growth[1]	51 TPD 18%	47 TPD 21%

[1] This projection assumes that emission rates per capita are the same in 2000 as in 1990.

Project alternatives must be combined with land use controls, zoning designations, other economic stimulants, transportation policies, and regional decisions to achieve improved air quality.

The social and economic factors associated with a concerted city effort to focus growth and the concomitant city, state, and federal investments required to achieve these air quality goals could be estimated and compared with the benefits achieved to provide decisionmakers with the net effect of mitigative measures designed to reduce detrimental transportation impacts.

G. seismic hazards of concentrated population

G. SEISMIC HAZARDS OF CONCENTRATED POPULATION

Scenarios for the future of the City of Los Angeles provide for a greatly increased concentration of population in the Regional Core. Because the Los Angeles area is in a seismically active area, the seismic hazards of such a concentration should be reviewed. Seismic hazards are the product of the population or resources at risk, the probability of earthquake shaking, and the susceptibility to damage of the structures occupied by the population or resources at risk. The current seismic hazards in the Los Angeles area may be characterized by the current population and resources, the probability of a serious earthquake (which is 100 percent over a lengthy period) and the current mix of housing, commercial and industrial structures. For the scenario under consideration, the population at risk would either remain the same or undergo a modest increase, and the probability of a serious earthquake would probably remain unchanged unless the location of concentrated population were to be particularly active seismically. The major potential for change in seismic hazards to population is in the area of susceptibility to damage of the structures occupied by the population in a higher density Regional Core. The current mix of structures is heavily weighted in favor of single-family wood frame structures and older commercial, industrial, and high density residential structures. Single-family wood frame structures are the safest structures during a serious earthquake. Older structures, particularly those built before 1933, when building codes first began to seriously enforce seismic designs, are the most dangerous structures to occupy during a serious earthquake. A concentrated population in the Regional Core would require at once the loss of the marginal safety inherent in single-family wood frame houses over that offered by new higher density dwellings and a potential for a marked increase in safety as the older pre-1933 structures would be exchanged for new and much safer higher density structures. Given the current regional earthquake safety standards enforced by the City of Los Angeles, the net effect of concentrating population in the Regional Core would be to markedly reduce the net susceptibility of the structures in Los Angeles to earthquake damage and reduce the net seismic hazard.

Because this scenario envisions a major construction effort, the dollar value of the resources (new structures) at risk in Los Angeles would be increased; however, this potential increase in resource hazards would likely be offset by reduced susceptibility to damage of these new structures.

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Urbanization does, however, generally increase the volume of water runoff and, thus, the potential for damage by erosion or flooding. The volume of runoff is governed principally by the infiltration characteristics of the land which is related to slope, soil type, and cover. The change in the cover of land by urbanization with impervious surfaces of roofs, streets, and other improvements directly and most significantly alters the runoff volume (Division of Soil Conservation, 1971). Data from this report indicate that even a modest degree of urbanization (20 percent impervious area) will double the frequency of flood flows, and relatively dense urbanization (60 percent impervious cover) will increase the frequency of flood flows by a factor of 5, unless flood control measures are applied.

As noted in Section II.C.5, an extensive flood control system is in existence throughout both the Hyperion and Terminal Island Service Areas. As discussed in that section, the major channels are built to accommodate the waters of a "50-year" storm, and the underground drainage facilities to provide relief from a storm of 10-year severity. In connection with the development of new subdivisions, storm drains are required when the expected runoff from a 10-year storm will be objectionable to the use of the streets (Department of City Planning and Department of Public Works, 1968).

Although strict quantification of impacts is not feasible, it is possible to draw the following general conclusions with respect to flood-related secondary impacts of the Facilities Plan.

1. The areas of the San Fernando Valley into which populations could potentially be drawn by provision of sewage service are less subject to flood or inundation hazards than are other parts of the Hyperion Service Area, particularly those south of the Santa Monica Mountains.
2. The existing flood control facilities downstream of the San Fernando Valley locations are likely to be relatively unaffected by the incrementally increased runoff associated with development.
3. To the extent that the provisions of the Drainage Plan are implemented, most of the additional costs will be borne by developers rather than the general public, but some expenditure of public funds for additional facilities is possible.
4. To the extent that the additional runoff cannot be recaptured downstream (unlikely during flood conditions), a corresponding volume of water will be lost to the groundwater basin, and must be replaced by imported (or reclaimed) water. This volume is not expected to be large in proportion to the present recharge of the groundwater basin by local precipitation.

The only remaining uncertainty in evaluating the potential change in seismic hazards is the question of the seismic activities of the Regional Core. Figures IX-21 and IX-22 present the locations of the active and potentially active faults, and the epicenters (locations) and magnitude of historical earthquakes in the Los Angeles area. As can be seen, the Regional Core borders on several very active areas, but is itself relatively inactive. The only potentially active fault substantially within the Regional Core is the Santa Monica-Raymond fault system. The conclusion which could be drawn from Figure IX-22 is that the seismic activity of the Regional Core is probably less than the region as a whole, and is certainly no more active than the region. Other factors which might be considered are the susceptibilities of the soils underlying the Regional Core to earthquake shaking. While this susceptibility is not uniform throughout the region, on the scale under discussion, the susceptibility of the Regional Core is comparable to most other building sites in the region.

On this basis, it may be concluded that the seismic hazards of concentrated population in the Regional Core, as defined here, is somewhat less than the existing situation.

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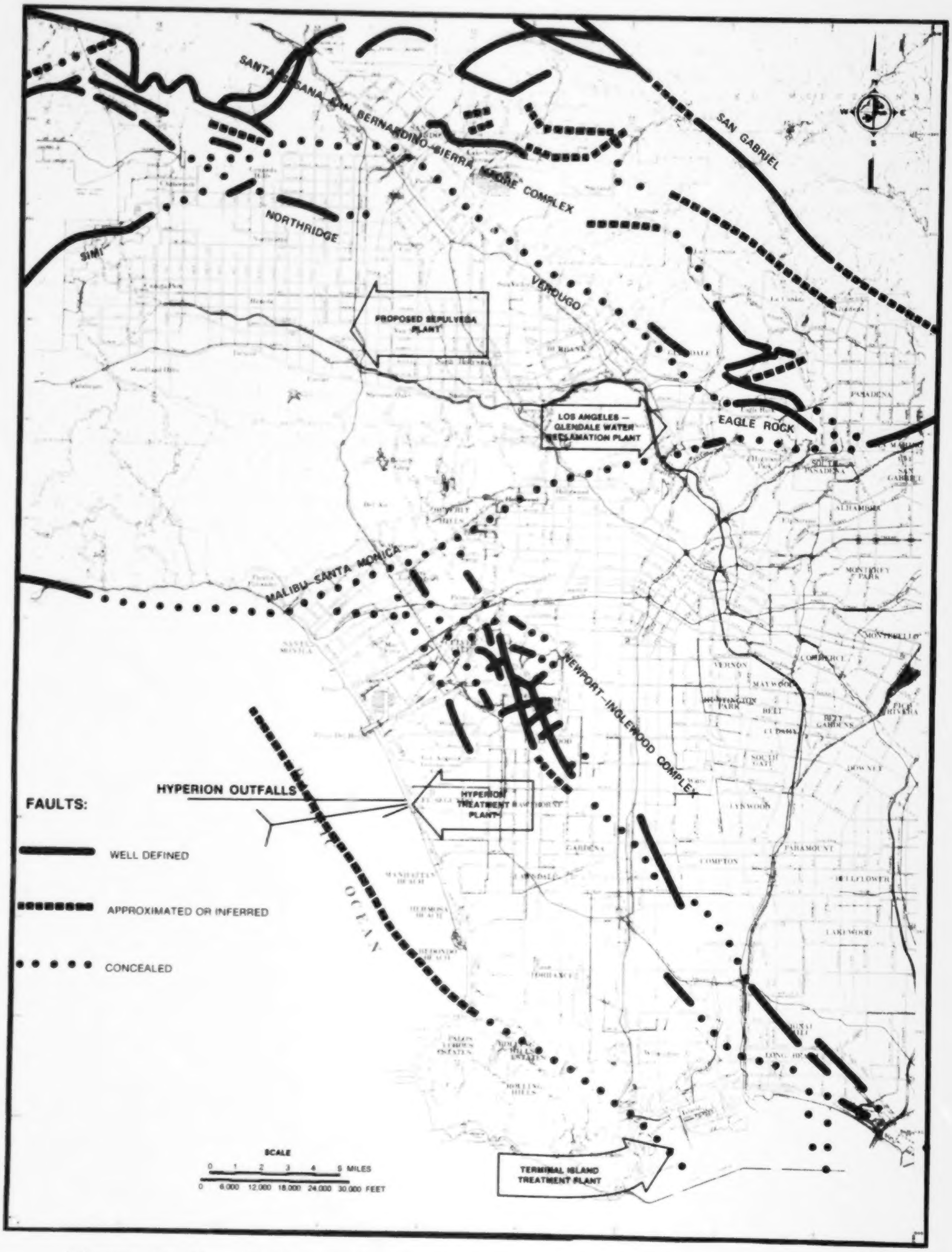
SANTA SUSANA-SAN BERNARDINO-SIERRA MADRE COMPLEX
SAN GABRIEL
NORTHRIDGE
SIMI
VERDUGO
PROPOSED SEPULVEDA PLANT
LOS ANGELES — GLENDALE WATER RECLAMATION PLANT
EAGLE ROCK
MALIBU-SANTA MONICA
NEWPORT-INGLEWOOD COMPLEX
HYPERION OUTFALLS
HYPERION TREATMENT PLANT
OCEAN
TERMINAL ISLAND TREATMENT PLANT
FAULTS:
WELL DEFINED
APPROXIMATED OR INFERRED
CONCEALED
SCALE
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0 6,000 12,000 18,000 24,000 30,000 FEET

Figure IX-21. Active and potentially active faults in Los Angeles.

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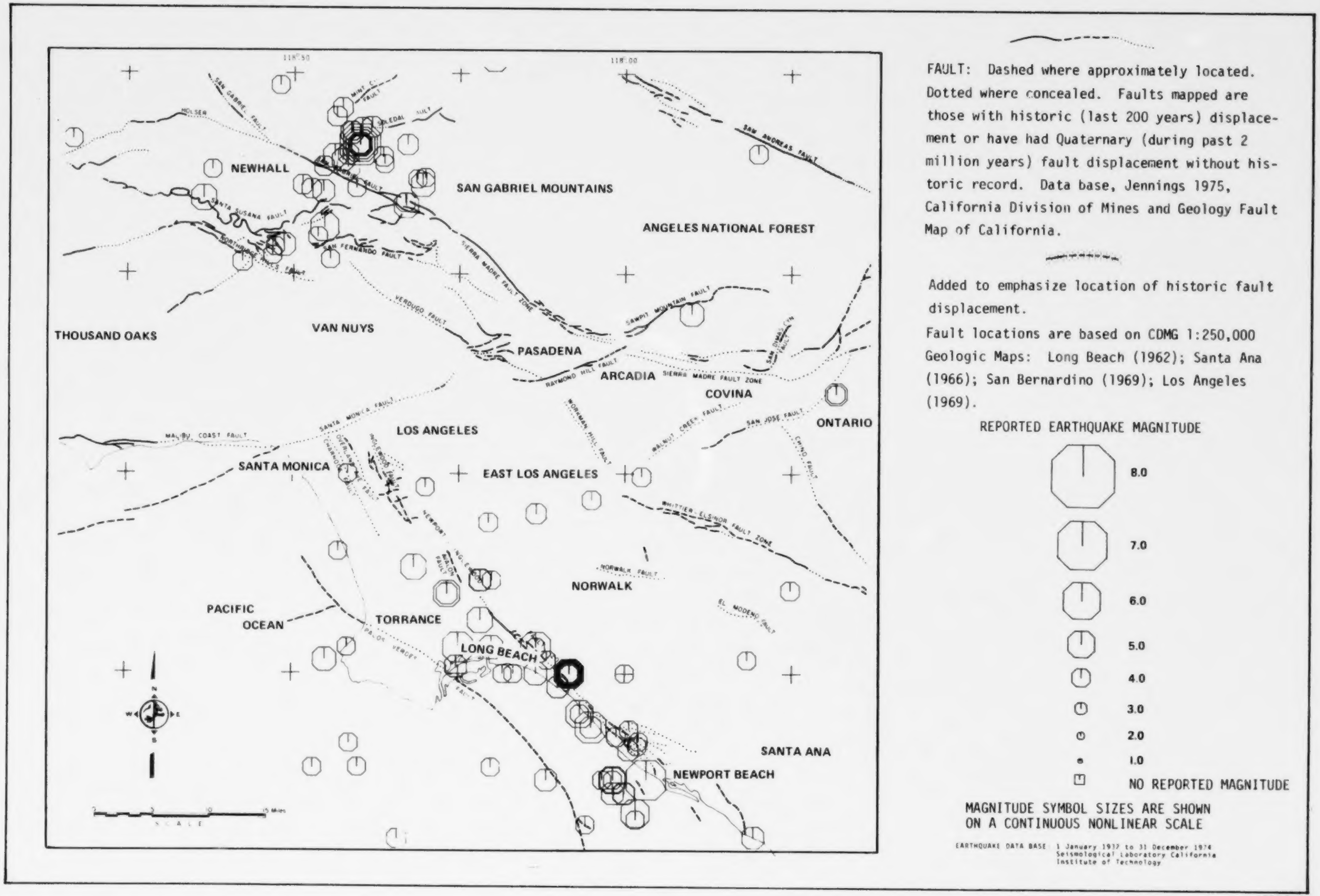
THOUSAND OAKS
NEWHALL
VAN NUYS
SAN GABRIEL MOUNTAINS
ANGELES NATIONAL FOREST
PASADENA
ARCADIA
COVINA
ONTARIO
LOS ANGELES
SANTA MONICA
EAST LOS ANGELES
NORWALK
TORRANCE
LONG BEACH
PACIFIC OCEAN
SANTA ANA
NEWPORT BEACH
SAN ANDREAS FAULT
SAN GABRIEL FAULT
SANTA SUSANA FAULT
SAN FERNANDO FAULT
SOLEDAD FAULT
SIERRA MADRE FAULT ZONE
VERDUGO FAULT
RAYMOND HILL FAULT
SAWPIT MOUNTAIN FAULT
SAN DIMAS CYN FAULT
SAN JOSE FAULT
CHINO FAULT
WALNUT CREEK FAULT
WORKMAN HILL FAULT
WHITTIER-ELSINOR FAULT ZONE
NORWALK FAULT
EL MODENO FAULT
MALIBU COAST FAULT
SANTA MONICA FAULT
INGLEWOOD FAULT
NEWPORT
AVALON FAULT
PALOS VERDES FAULT
118°30
118°00
N
S
E
W
SCALE
5 Miles
REPORTED EARTHQUAKE MAGNITUDE
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
NO REPORTED MAGNITUDE
198P-374

FAULT: Dashed where approximately located. Dotted where concealed. Faults mapped are those with historic (last 200 years) displacement or have had Quaternary (during past 2 million years) fault displacement without historic record. Data base, Jennings 1975, California Division of Mines and Geology Fault Map of California.

Added to emphasize location of historic fault displacement.

Fault locations are based on CDMG 1:250,000 Geologic Maps: Long Beach (1962); Santa Ana (1966); San Bernardino (1969); Los Angeles (1969).

MAGNITUDE SYMBOL SIZES ARE SHOWN ON A CONTINUOUS NONLINEAR SCALE

EARTHQUAKE DATA BASE 1 January 1932 to 31 December 1974 Seismological Laboratory California Institute of Technology

Figure IX-22. Epicenters and magnitudes of historical earthquakes near Los Angeles.

H. secondary impacts on biology

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H. SECONDARY IMPACTS ON BIOLOGY

Local changes of population size and land use usually have local influences on the biology of the land involved. Approximately 10,000 acres of vacant land, including some agricultural areas, will be converted to residential uses, and the biological nature of the land will be altered.

The second identifiable type of impact that could result from growth or shifts of population is that of increased air pollution on native vegetation and agricultural crops away from sites where land use has changed.

A proportion of downwind impacts on agricultural land, forests, and deserts are attributable to Los Angeles. Emissions will increase 12 percent for reactive hydrocarbons, and 14 percent for oxides of nitrogen by 1990, with the SCAG-76 population increases accommodated by Alternatives B4C, C3, and E2. These increased emissions will be reflected in increased downwind impacts.

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I. references

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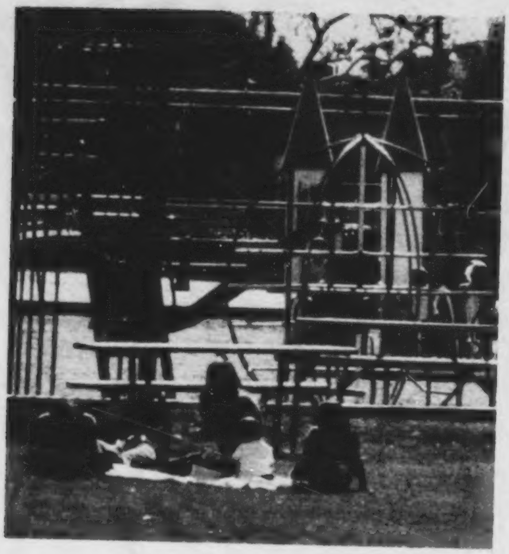

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Chapter X
mitigation measures

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A. mitigation measures for primary impacts

A. MITIGATION MEASURES FOR PRIMARY IMPACTS

1. INTRODUCTION

Chapter VIII identified the major primary impacts associated with alternative facilities plans. Specific construction projects associated with the alternatives include treatment plants, interceptor sewers, and reclaimed water distribution systems. Both positive (favorable) and negative (unfavorable) impacts of construction and operation were identified.

This section addresses the potential methods that can be applied to reduce or mitigate the negative or unfavorable impacts identified in Chapter VIII. In addition to alternative specific mitigative measures, this section suggests certain other strategies that might be applied to reduce the overall impacts of any of the alternative systems.

a. Summary of Construction Impacts. Identified negative impacts from construction activities include:

- Increases in air pollution associated with demolition, grading, other onsite construction activities including operation of stationary engines, and onsite and offsite traffic.
- Noise and vibration associated with demolition, operation of onsite vehicles and equipment and offsite traffic.
- Losses of vegetation and wildlife.
- Generation of odors, particularly during renovation and reconstruction of the Hyperion Treatment Plant (HTP).
- Generation of additional traffic, and potential disruption of normal traffic flow (particularly at HTP, and also associated with construction of sewer lines).
- Temporary reduction of effluent quality to the ocean (at HTP).
- Potential siltation of streams or storm drains, or contamination of surface or subsurface waters by uncontrolled runoff from construction sites, or from "spoils" piles of excavated materials from the construction sites.

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- Potential destruction of some paleontological or archaeological materials.
- Potential interference with access to two historical sites (associated with the installation of the Sepulveda Water Delivery System).
- Potential delays in completion associated with severe flooding conditions (at the Sepulveda Facility).
- Potential displacement of sources of employment and loss of tax revenues (at the La Cienega Facility).
- Possible temporary loss or degradation of access to essential services (schools, fire and police stations, hospitals, etc.) during installation of interceptor or relief sewers.
- Possible interference with groundwater supplies or contamination of groundwater associated with tunneling operations.

b. Construction Impact Mitigation Responsibilities. Mitigation of these conditions, to the extent that they can be mitigated, is the joint responsibility of the City and the contractor performing the work. Mitigations can be "designed into" the projects by the City through their plans, specifications, and contract provisions. The contractor, in turn, must implement the provisions through proper supervision and attention to environmental factors.

Some degree of mitigation is inherent in the contracting procedure, since the contractor is required by the City to adhere to the provisions of the "Standard Specifications for Public Works Construction" (APWA and AGC, 1976). Among the mitigating provisions in the specifications are:

- Utilities are not to be disturbed without the permission of the owner.
- The contractor must be insured to specified limits against bodily injury and property damage.
- Dust nuisances must be abated by cleaning, sweeping, and sprinkling with water, or other means as necessary.
- Paved areas must be cleaned at least once a day when specified.
- Mud may not accumulate on roads.
- Materials must not be allowed to spill on haul routes, and must be cleaned up as necessary.
- Excess material must be removed from catch basins (so that they do not lose capacity).

- The contractor "shall not discharge smoke, dust, or any other such contaminants into the atmosphere in such a quantity as will violate the regulations of any legally constituted authority."
- Enclosed toilet facilities must be maintained for the workers, meeting all applicable laws, ordinances, and regulations, and there must be no disruption of sewage service.
- Where necessary, sewers must be diverted to other sewers through enclosed structures—no open trenches are permissible.
- Every reasonable precaution must be taken to protect channels, storm drains, and bodies of water from pollution and operations must be scheduled to avoid their muddying and silting.
- Trees, lawns, and shrubbery that are not to be removed must be protected from damage or injury, or, if damaged or removed, restored. Reasonable notice must also be given to affected residents so that they can salvage or relocate plants, fences, sprinklers, and the like.
- Traffic associated with the project must cause no unnecessary inconvenience. Safe and adequate pedestrian and vehicular access must be provided and maintained to fire hydrants, commercial and industrial establishments, churches, schools, parking lots, service stations, motels, fire and police stations, hospitals, and the like. One half of any affected roadway must remain unobstructed if feasible.
- All excavations 5 feet or more in depth must be adequately sloped, shored, or braced for safety.

The contractor is required by law to comply with all federal and state Occupational Safety and Health Act (OSHA) requirements.

The Standard Specifications for Public Works Construction require the contractor to mitigate some, but not all, of the identified impacts. For example, there are no specific requirements with respect to construction noise, as influenced by such factors as construction activities, traffic, and hours of work. Although the contractor is required by Section 7-13 of the Standard Specifications to comply with all applicable laws, ordinances, and regulations, these restrictions may not cover specific impacts, or the contractor may not be aware of the specific law, ordinance, or regulation involved. It is thus the responsibility of the City to ensure that pertinent requirements are incorporated into the Contract documents either specifically or by reference. The practices adopted by the contractor for conformance are generally his prerogative, so long as they achieve the specified results.

c. Summary of Operational Impacts. Operational impacts are related to the design of the selected alternative and the way in which it is operated. They begin to occur after the plants and associated installations are completed by the contractor, accepted by the City, and placed into operation. Except for the "No Project" Alternative, there are relatively small but nonetheless real differences among the alternatives in their potential impacts. These include the effects of temporary outages of the plants (e.g., related to potential earthquake damage, operator error, reliability and redundancy, input of materials that interfere with the processes), operational noise, odors, differences in discharges to receiving waters, and the like. In general, all of the viable alternatives provide equivalent levels of service and have designed-in characteristics, and few mitigations of the operational impacts are feasible.

2. MEASURES DESIGNED TO MITIGATE PRIMARY IMPACTS OF ALTERNATIVES

a. No Project (Alternative A1). The No Project Alternative includes modernization of the Hyperion Treatment Plant (HTP) and construction of an additional 100 mgd of secondary capacity. Sludge would continue to be discharged to the ocean. The Los Angeles-Glendale Water Reclamation Plant (LAGWRP) would form part of the overall system, but no additional facilities would be constructed. Only minor repairs and maintenance would be made to this system within its operating life.

(1) CONSTRUCTION IMPACTS. All construction impacts would occur at HTP under this alternative. The precise schedule for the activities involved, if performed separately from the overall upgrading to full secondary treatment, is not known in detail. However, one planned element is installation of an effluent eductor in place of the present pumps for the 5-mile outfall. During the installation period, it will be necessary to discharge chlorinated wastewater through the 1-mile outfall for a period of 2 to 3 weeks. It would be preferable to schedule this operation for a period both of low rainfall (so that the capacity of the 1-mile outfall is not exceeded) and of low use of the beaches—i.e., for a time just prior to or just after the summer period when beaches are in heavy use. Frequent monitoring of nearshore water quality would also be desirable during this time.

Noise controls are not imposed on the contractor by the Standard Specifications. To mitigate construction noise, two major countermeasures are possible: the use of portable noise barriers and reduction in noise produced by the source devices themselves (Wyle Laboratories, 1975).

Pile driving will be required at the Hyperion site, and it is EPA policy (EPA, 1975) that whenever pile driving is performed in a sensitive residential or wildlife area, approval of plans and specifications is granted on the condition that resulting noise be limited to a maximum of 86 dB(A) at 50 feet and 80 dB(A) at 100 feet or 65 dB(A) at the nearest residential property line. Although this is a highly restrictive noise limit, it is technically achievable and is necessary to minimize adverse effects on residents near the construction sites. To achieve this level, portable barriers may be used. Further investigation is required to determine whether the short duration of the pile drivers actually warrants these mitigation measures.

General construction noise reduction measures include:

- Use of nonimpact tools where feasible.
- Maintenance of equipment to reduce noise from excessive vibration, faulty mufflers, or other sources.
- Use of baffler around stationary engines or air compressors.
- Work scheduling to minimize impacts during evening or early morning hours.

Transportation-related noise can best be mitigated by maintaining equipment in proper working order, minimizing excessive vibration, and using equipment that meets applicable federal and state motor vehicle noise standards.

If archaeological or paleontological resources are discovered during the course of the work, a qualified archaeologist or paleontologist should be retained to inspect the site and conduct such recovery activities as may be indicated.

(2) OPERATIONAL IMPACTS. There are three operational impacts of the No Project Alternative that are potentially subject to mitigation:

1. Effluent quality at HTP although imposed over present levels, will still be in violation of state and federal requirements.
2. HTP is expected to release more odors than would be the case where it fully developed as planned in the other alternatives.
3. Ponding of water discharged into the Los Angeles River by LAGWRP is expected in the downstream reach below Firestone Boulevard, with possible generation of objectionable odors and insects.

The only effective mitigation of the substandard effluent quality would involve additional construction of facilities, which violates the concept of "No Project." However, some reductions in the level of toxicants both in the effluent proper and in the sludge could be obtained through implementation of vigorous enforcement of the existing industrial pretreatment program. A citizen involvement program could encourage composting or disposing of much of the biologically active material that currently reaches the sewage stream via garbage disposals. Reduction of this conversion of solid to liquid wastes will reduce biochemical oxygen demand (BOD) of the wastewater. A high level of citizen cooperation and interest is very difficult to implement except under crisis conditions.

An engineering/environmental study would be required to determine the most effective method of odor control, and specifics have not been generated for this EIS. Various possibilities exist, and it is beyond the scope of this report to suggest the "best" of the possible alternatives.

Ponding of LAGWRP water may or may not present a problem in the Los Angeles River below Firestone Boulevard. This potential exists for all alternatives, so that the actual conditions encountered should be monitored during the dry season months. If unacceptable conditions are found to exist, the capacity of the low-flow section could be increased (e.g., by construction of walls along its edge), or localized modifications made to the river-bottom contour to alleviate the ponding condition. Such permanent structural modifications are considered environmentally superior to repeated application of chemical control agents.

b. Inland/Coastal Split of Treatment Capacity (Alternative B4C). The selected Inland/Coastal Split Alternative includes:

- Conversion of HTP to a full secondary treatment plant with 307-mgd capacity.
- Construction of the Sepulveda Facility with an initial tertiary treatment capacity of 40 mgd, followed by additions of 30 mgd and 15 mgd at later dates.
- Construction of a 10-mgd addition to the Los Angeles-Glendale Water Reclamation Plant (LAGWRP) at a later date.
- Construction of the first section of the East Valley Interceptor Sewer (EVIS I), followed by construction of its extension (EVIS II) at a later date.
- Construction of the Sepulveda and Griffith Park water distribution systems.

Construction timing for these elements was given in Table VIII-1.

(1) CONSTRUCTION IMPACTS.

(a) Hyperion Treatment Plant. Of the construction impacts anticipated for the Inland/Coastal Split Alternative, those at HTP are expected to be most severe and of the longest duration. Construction will occur at the site of an existing facility, within a relatively small area, and will involve demolition of existing facilities as well as construction of new ones.

A Draft Environmental Impact Report on the project has been issued, public hearings have been held, and a Final Environmental Impact Report has been published (Department of Public Works, May 24, 1976). The mitigations measures described in that report (pp. 133-134) for the construction phase are as follows:

1. Construction dust, noise, and odors will be partially controlled by the contractor's adherence to the provisions of "Standard Specifications for Public Works Construction," and by adherence to the guidelines established by the California Occupational Safety and Health Act. Construction will be limited to standard weekday working hours.
2. Sewage odors will probably be controlled by some means of dispersion in which fans may be used to dissipate odors to nondetectable levels.
3. Should traffic congestion become significant, traffic control personnel and equipment will be utilized to alleviate traffic problems.
4. The period of beach closure will be kept to a minimum by explicitly limiting the allowable construction period in the bid specifications. The present estimated time for construction is 4 months.
5. Potable water demand can only be reduced by the availability of some other source of water. Seawater is unacceptable for the intended water usage (e.g., irrigation, wash water). The Department of Water and Power has been contacted and an estimate of the water supply available to Hyperion has been provided . . .
6. Termination of secondary treatment will cause increased concentrations of pollutants to be discharged to Santa Monica Bay. The increase in pollutants will result in a violation of the existing NPDES permit limits. Primary effluent would be discharged instead of a combined primary and secondary effluent. The difference between pollutant concentration and primary effluent and the combined primary/secondary effluent (5-mile outfall effluent) is shown in Table 2 of Wastewater Characteristics (Table VIII-4). Subsidiary alternative projects which would not involve removal of existing secondary facilities were discussed in Chapter VII. Chemical addition to the primary tanks is a potential mitigation measure to reduce effluent concentrations.

Implementation of the project is expected to involve excavation and removal of approximately 1.5 million cubic yards of material with a high content of sand. The disposal site for this material has not been determined. Use for rehabilitation of County beaches has been suggested and would be a desirable option if economically feasible. Consideration of Los Angeles International Airport property as an alternative disposal site should include possible impacts on the habitat of the El Segundo Blue butterfly, an endangered species.

Approximately one truck is expected to enter or leave the site each minute during construction, with an overload condition created on Vista del Mar to the west of the site. Traffic control will be required to minimize congestion.

Noise generation is not controlled by the Standard Specifications, and appropriate noise control requirements should be placed on the contractor, as discussed under the No Project Alternative. Although the area is subject to relatively high noise levels because of its proximity to the ocean and LAX, demolition activities are inherently noisy and appropriate means should be taken to minimize these effects. Such measures include scheduling, use of mobile baffles, and appropriate maintenance of equipment.

Information available for this report was insufficient for an evaluation of the impact of the proposed discharge of mixed liquor from the existing secondary tanks. If subsequent studies show such direct discharges to be potentially harmful, a feasible alternative may be aerobic digestion in the tanks prior to discharge, possibly with the sludge separated and routed to the 7-mile outfall.

If archaeological or paleontological remains are discovered during construction activities, they should be examined by qualified specialists and collected if indicated. (This procedure should be adopted for all construction sites, and appropriate requirements placed on the contractor.)

(b) Sepulveda Facility. The site for the Sepulveda Facility has already been prepared, and the predicted construction impacts are minor as compared with those at HTP. Application of the requirements of the Standard Specifications and provisions for examination and/or recovery of archaeological/paleontological resources, if encountered, should provide sufficient mitigations of potential impacts. The same restrictions should apply to the subsequent additions, unless unexpected conditions are encountered during actual construction, or local conditions change appreciably in the interim.

(c) Los Angeles-Glendale Water Treatment Plant Addition. Although the site for the proposed 10 mgd addition at LAGWRP has not been prepared, the same general conclusions with respect to mitigations apply here as at the Sepulveda Facility.

(d) EVIS Construction. Except for additional requirements imposed on noise generation and preservation of archaeological and paleontological remains, the Standard Specifications should provide adequate mitigation for the potential impacts of construction of EVIS I and II. The area should be surveyed, however, for particularly sensitive receptors (e.g., schools, hospitals), and stringent noise control measures applied in their vicinity.

(e) Sepulveda and Griffith Park Water Distribution Systems. The general mitigation measures applicable to EVIS similarly apply to these systems, although their construction is not expected to influence noise levels at such sites as schools and hospitals. The contractor should be required to maintain access and avoid damage to the two historical sites identified near the course of the Sepulveda Water Distribution System (Louise Avenue oak tree and Rancho El Encino on Moorpark Avenue).

(2) OPERATIONAL IMPACTS. Under normal operating conditions, the Inland/Coastal Split Alternative produces no serious impacts subject to known mitigation techniques, other than those discussed for LAGWRP flows under the No Project Alternative. The Hyperion Treatment Plant effluent is predicted to contain some constituents that will not meet the Ocean Plan 50 percent standards (see p. VIII-86), but this is not known with certainty. More stringent source controls rather than differing treatment methods are likely to be a more sound and achievable method for mitigating this condition (if it is found to exist as predicted). However, one of the constituents (chromium) is believed to come from such a large number of small sources that source control as such is not considered to be feasible.

The principal operational phase impacts would occur if specific plants were out of operation or were operating under substandard conditions for some reason, e.g., earthquake damage, process failures, or flooding. The plants have been designed with most reasonable contingencies in mind to mitigate the possibilities of such occurrences: e.g., by provision of standby generators in event of power failures. Both HTP and LAGWRP are protected from 250-year floods. The Sepulveda Facility will maintain a capability for secondary treatment under 100-year flood conditions, with flash chlorination and turbulent mixing of the wastewater but no tertiary treatment. Manual diversion systems are planned, and automated diversion systems are being evaluated for plant overload or upset.

c. Coastal Capacity with San Fernando Valley Hydraulic Relief. The Coastal Capacity with San Fernando Valley Hydraulic Relief Alternative (C3) includes:

1. Conversion of HTP to a full secondary treatment plant with 397 mgd of capacity.
2. Retaining LAGWRP at its present 20 mgd capacity, and constructing its water delivery system.

3. Construction of an Additional Valley Outfall Relief Sewer (AVORS) extension via an approximately 10.5 mile long tunnel through the Santa Monica Mountains, and then by pipe and shorter tunnel sections to the North Central Outfall Sewer (NCOS) in Culver City.

4. Construction of the Woodman Avenue Relief Sewer, following the same path as EVIS except in its southernmost reach, where it would be routed to join AVORS and drain southward through the new tunnel.

(1) CONSTRUCTION IMPACTS.

(a) Hyperion Treatment Plant. Although HTP would be constructed at 397 vs 307 mgd under this alternative, the suggested mitigation measures are essentially the same as for the Inland/Coastal Split Alternative.

(b) Los Angeles-Glendale Water Reclamation Plant. There will be no construction activities at LAGWRP under this alternative. Mitigations for construction of its water delivery systems are the same as described for the Inland/Coastal Alternative.

(c) AVORS Extension. Mitigations for the conventional (pipeline) sections of the AVORS extension will be the same as described for EVIS.

The tunnel section (which presumably will be driven from both north and south faces) will constitute a horizontal well, and can be expected to generate substantial amounts of water during its construction. The quality of this water should be monitored, and, where feasible, it should be spread and recaptured. (This will likely be feasible only from the north portal.) Poor quality water should be routed in such a way as to minimize potential contamination of useful groundwater.

Wells and springs in the overlying Santa Monica Mountains should be monitored regularly to determine if tunneling operations are influencing water levels. Although it is unlikely that mitigating measures can be applied other than completion and lining of the tunnel, such monitoring will establish preexisting conditions and impacts in event of later litigation.

The construction of the tunnel will provide an opportunity to gather substantial data on the geology of the portion of the Santa Monica Mountains that it traverses. It should therefore be mapped by a competent geologist and, if feasible, grab samples of the various formations penetrated made available to interested scientific and commercial geological groups.

Additional survey of potential alignments particularly at the southern end of the tunnel should be performed to map potential archaeological and paleontological resources. These data should be taken into consideration prior to final adoption of a route. Should it not be possible to mitigate impacts through routing, a determination of the cultural significance of potentially disturbed resources should be performed and a data recovery program proposed.

(2) OPERATION IMPACTS. Under normal operating conditions, the C3 Alternative produces no serious impacts subject to known mitigation techniques, other than those discussed for LAGWRP flows under the No Project Alternative. Effluent constituent problems may exist at HTP, with mitigations as discussed under the Inland/Coastal Split Alternative.

Mitigation measures applicable to the Woodman Avenue Relief Sewer are the same as described previously for EVIS under the Inland/Coastal Split Alternative.

This alternative concentrates most of the treatment capacity at a single plant, and is thus the least responsive of all viable alternatives to plant upsets or damage.

d. Coastal Capacity without Hydraulic Relief to the San Fernando Valley (Alternative CX). The Coastal Capacity without Hydraulic Relief to the San Fernando Valley Alternative involves:

1. Conversion of HTP to a full secondary treatment plant with 387 mgd capacity.
2. Construction of a 10 mgd addition (tertiary treatment) at LAGWRP.
3. Construction of the Griffith Park water distribution system.

(1) CONSTRUCTION IMPACTS. Suggested construction mitigation measures for this alternative are the same for Hyperion and LAGWRP with its water distribution system to Griffith Park as described under the Coastal/Inland Split Alternative.

(2) OPERATIONAL IMPACTS. Suggested mitigations for operational impacts of this alternative are the same as for Alternative B4C.

e. Inland/Coastal Split with Maximum Potential for Reclamation (Alternative E2). The Inland/Coastal Split with Maximum Potential for Reclamation Alternative includes:

1. Conversion of HTP to a full secondary treatment plant with 307 mgd capacity.

2. Construction of the 75 mgd La Cienega Water Reclamation Plant at a later date.
3. Subsequent conversion of HTP to 232 mgd secondary capacity, with 50 mgd receiving advanced treatment for water reclamation.
4. Construction of all other elements described under the Inland/Coastal Split Alternative, B4C.

The time phasing of the various construction activities was given in Table VIII-1.

(1) CONSTRUCTION IMPACTS. Mitigations for the impacts of construction of all elements of this alternative except the La Cienega Water Reclamation Plant (LCWRP) are the same as those described previously under the Inland/Coastal Split Alternative, B4C.

Construction of LCWRP may require demolition of an existing commercial activity. The actual site has yet to be finalized, but the most promising involved demolition and construction noise and dust potentially affecting a large population in both Los Angeles and Culver City. Appropriate noise and dust control requirements should consequently be placed on the contractor in addition to the Standard Specifications.

There is a potential local economic disruption and loss of tax revenue, employment, and marketing facilities if the existing FedCo store relocates at a substantial distance from the site and/or out of the City. Every legally acceptable effort should be made to aid the displaced enterprise to find a suitable location within the immediate vicinity. Additional details are provided in the Reclamation Addenda.

(2) OPERATIONAL IMPACTS. Mitigations of operational impacts are essentially the same as those discussed for the Inland/Coastal Split Alternative. This alternative, with one additional plant of substantial capacity, provides the greatest degree of flexibility in accommodating a plant outage caused by physical damage, operator error, or input wastewater-induced upset.

3. MEASURES DESIGNED TO MINIMIZE INFLUENT

Wastewater flows, and thus the required capacities of collector systems and treatment plants, can be reduced by conservation measures that reduce inputs into the sanitary sewer system. Such a reduction in wastewater flows could affect wastewater facilities in at least three ways (Department of Water Resources, 1976):

- The capacity of existing gravity-flow sewage collection systems to carry solid wastes could be affected by reduced flows. Theoretically, a reduced toilet flush of 3.5 gallons only slightly affects the performance of properly designed laterals, submains, and mains. However, when the existing carrying ability is already marginal, stoppages could occur. Only a field evaluation of any additional maintenance for individual lines in a system can fully determine what impact reduced flow will have. Where existing collection systems are overloaded, the effect would be beneficial.

- The reduced flow will not substantially affect the efficiency of biological (secondary) treatment, because the primary basis for facility design is the quantity of waste loading. On the other hand, lower flows would reduce the load on other plant facilities such as sedimentation tanks. The overall effect should be to extend the capacity of sewage treatment facilities.
- Sewage plant effluent would have higher concentrations of salts and other materials (i.e., higher TDS). This would affect the concentrations of the various materials discharged. However, the total quantities discharged would be reduced. Higher TDS levels would also have some influence on reclamation potential.

Water conservation as such does not necessarily influence wastewater flows. Efforts to reduce water consumption by prohibiting hosing down of sidewalks, restricting the hours during which lawns and gardens may be irrigated, reducing car washing and the like are environmentally sound, save water and energy, but do not result in reduced wastewater flows. Only those measures that affect the amount of water actually entering the sanitary sewer lines can be effective in this regard.

As a statewide average, approximately 56 percent of residential water use is for interior use, with the remaining 44 percent principally used for landscape watering (Department of Water Resources, 1976). The exact percentage for a given area varies principally with the mix of dwellings (multiple-family dwellings generally use less landscaping per capita than do single-family dwellings), and to a lesser degree on other factors. Approximately the same 56/44 ratio is assumed for commercial water consumption, although with less confidence.

Data from Table II-13 show that total water use in the DWP system, excluding power generation and irrigation, amounted to approximately 167 gallons per capita per day (gpcpd). Of this, residential consumption was approximately 83.9 and commercial 69.4 gpcpd.

Water savings as a percentage of interior use have been estimated as follows by the Department of Water Resources:

New Construction

Feature	Water Savings as a % of Interior Use
Low-flush toilets	18
Low-flow showerheads	12
Low-flow interior faucets	2
Pressure reducing valves	5
Insulated hot water lines	4
Low water using clothes washers	5
Low water using dishwashers	4
TOTAL	50

Existing Housing

Feature	Water Savings as a % of Interior Use
Plastic bottles or water dams in toilet reservoir	18
Low-flow showerheads or flow restrictors	12
Low-flow faucet aerators	2
Pressure reducing valves	
Insulated hot water lines	1
TOTAL	38

For new construction, some of these features could be mandated by building codes, and are under local control. Nonfixed devices such as water conserving clothes washers and dishwashers would likely require control at the state level to be mandatory for sale. Most of the features for existing structures require voluntary cooperation, which could possibly be encouraged by rate structures or penalties for excessive use. These figures, thus, indicate potential, but realistically unattainable maximums and should be adjusted downward to be applied.

Similar quantitative data are not available for commercial and governmental uses, which are principally for sanitation and irrigation. However, new tank-type toilets use only 3.5 gallons/flush as compared with 5 to 7 gallons for conventional types, and faucet aerators reduce flows from 5 gallons/minute to 1.5 gallons/minute. (At the state level, Section 17921.3 of the Health and Safety Code requires the use of low-flush toilets in hotels, motels, apartment houses, and dwellings constructed after January 1, 1978.)

Population projections for the Hyperion Service Area are as follows (see Table II-53):

Year	Population Millions
1975 (Census)	3.05
1980 (SCAG-76)	3.09
2000 (SCAG-76)	3.36

Assuming that all of the new population from 1980 to 2000 will live in new dwellings, and that over this period these dwellings will, on the average, incorporate half of the potential water-conserving features, a net saving of 5.7 mgd would be attainable. Further, assuming that 10 percent of the population would voluntarily adopt all of the listed water saving features for existing housing would result in a reduction of wastewater flows of approximately 9.6 mgd. Although these figures are rough estimates, they indicate that significant savings in wastewater flows can be obtained through conservation measures, and the extent to which voluntary citizen cooperation can be effective in flow reductions. Still further savings could be obtained through the voluntary cooperation of commercial establishments.

A concentrated program of water conservation with appropriate moral suasion and economic coercion could reduce the need for, or postpone the investment in, alternative modular expansion units for LAGWRP and other potential inland facilities.

4. MEASURES DESIGNED TO IMPROVE THE UNDERSTANDING OF IMPACTS OF OCEAN DISCHARGES

As noted in Sections III.B and C, the existing data base is inadequate for assessing the present marine impacts of HTP discharges and for predicting the changes that could occur as a result of altering the treatment as proposed in the various alternatives of the Facilities Plan. A number of studies could be conducted that would add substantially to the present data base and would aid in assessing the impacts of HTP discharges on the marine environment. The most pertinent and feasible studies are discussed below.

a. Analysis of Existing HTP Data. Hyperion has 14 years of plankton data collected in Santa Monica Bay from 1957 through 1970. Analysis of these taxonomic enumerations should give some indication of natural population variations as well as the past effects of changing the location of the outfalls.

The 1973 through 1976 benthos data collected by HTP personnel have not been analyzed and should be treated in a similar manner to the 1972 data (Section III.C). Such an analysis would be very advantageous in that it may show temporal trends. Furthermore, the 1972 data were from the first year of data collection while the techniques were still being worked out; the more recent data would provide a better indication of the past effects of the HTP discharges on benthic organism distribution and abundance.

b. Benthic Monitoring. The present HTP benthic monitoring program (benthos and sediments) should be continued and annual data analysis and comparisons to past data performed. In addition, more intensive benthic sampling should be conducted at regular intervals (e.g., seasonally) to determine the temporal and spatial changes in the sludge field. Sampling similar to the SCCWRP 400 m grid, except with replicate samples (at least three) at each station, is recommended. Such a sampling program should be continued after the cessation of sludge discharge to determine the length of time required for the sediments and infauna to return to a "natural" state.

Another study that could provide valuable information would be a sampling of the benthos living on or near the outfall pipes and an analysis of their tissues for metals, chlorinated hydrocarbons, and other toxic substances (e.g., cyanide and phenol). This type of study should provide information on bioaccumulation of toxicants in organisms that are continuously exposed to the effluents. Ages of these organisms should also be established, if possible, to determine the length of exposure.

c. Effluent Plumes. The temporal and spatial extent of the effluent plumes should be more accurately determined to better define the area of wastewater and sludge influence. A study by Dr. R. Kolpack of USC using light transmission has been done and may provide some very good information, but the data analysis and report preparation have yet to be finished for lack of funds. In addition to this work, further studies should be conducted under various conditions, such as upwelling, thermal stratification, high and low discharge rates, strong onshore winds, etc., using tracers (such as dyes). The benthic distribution data from the above studies should then be correlated with the plume distribution.

d. Bioaccumulation and Biomagnification. A more thorough monitoring and evaluation of metal, chlorinated hydrocarbon, and other chemical uptake and magnification in marine biota is essential.

5. MEASURES TO ELIMINATE ADVERSE IMPACTS RESULTING FROM CHLORINATION

The EPA effluent guidelines (40 CFR Part 133) require that fecal coliform bacteria levels (as MPN) do not exceed a geometric mean of 200/100 ml in a 30-day period, 400/100 ml in a 7-day period, or 2,000/100 ml for a daily maximum. The standard disinfection process used in sewage treatment is chlorination, and this is the proposed method for the inland treatment plants as well as for the HTP effluent used for irrigation or discharged from the 1-mile outfall. It has not yet been determined whether or not chlorination will be required for effluents from the 5-mile outfall.

The maximum allowable residual chlorine is 1 mg/l (30-day average) and 2 mg/l daily by the NPDES permits. Chlorine gas in water undergoes a rapid chemical reaction to form hypochlorous acid (HOCl) and hydrochloric acid (HCl) (Buelow and Klazer, 1967). When the pH is greater than 3.0 and the residual chlorine less than 1,000 mg/l, essentially no Cl_2 is present in the water. The chlorine residual is divided into free and combined. Free chlorine residual refers only to the concentration of the hypochlorite ion (OCl^-) and hypochlorous acid and is generally disregarded in sewage measurements. The combined residual chlorine is the chlorine in chemical combination with ammonia or organic nitrogen compounds (Buelow and Klazer, 1967).

Hypochlorous acid readily reacts with ammonia at a pH of 6.5 to 11 to form monochloramine (NH_2Cl). Water at 25 C containing 0.32 mg/l of ammonia nitrogen (HTP secondary effluent = 17 mg/l and inland plants = 10 mg/l) and receiving 0.8 mg/l of chlorine will convert 99 percent of the chlorine to monochloramine in 1 minute at a pH of 8.3 (Buelow and Klazer, 1967). The monochloramine dissociates into dichloramine ($NHCl_2$) in a reaction that is pH dependent, with monochloramine dominant when the pH is greater than 7. Chlorine also reacts with organic compounds through the processes of addition, substitution, and oxidation. These reactions, however, are generally slow in sewage. In addition, organics containing nitrogen react with chlorine to form chloroderivatives. Thus, the residual chlorine in the effluents will be almost exclusively the combined form.

The toxicity of free and combined residual chlorine to organisms is similar, although free residual chlorine acts faster and at lower concentrations (Brungs, 1972). A suggested mitigation measure for the toxic effects of chlorination is to use ozone as a means of disinfection at the inland treatment plant effluents. Ozone has been shown to reduce the concentrations of bacteria and viruses in wastewater more effectively than chlorine (Rosen, 1973). Other advantages of ozone are reduction of BOD and COD, increased DO, oxidation of many chemicals and organics (such as phenolics), and odor control (Rosen, 1973; Morris, undated). Furthermore, ozone is cost-competitive in larger treatment plants—that is, on the order of 80 mgd or larger (Valley, 1977, personal communication).

B. mitigation measures for secondary impacts

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B. MITIGATION MEASURES FOR SECONDARY IMPACTS

1. INTRODUCTION

The purpose of this section is to present and analyze various measures that would eliminate or minimize anticipated adverse secondary impacts resulting from the urbanization accommodated by the wastewater projects. Inherent in this analysis is the effective integration of land-use planning, transportation planning, air quality maintenance, and environmental protection (Environmental Protection Agency, November, 1974).

a. Basic Approach for Mitigation Strategies. The secondary impacts of the proposed Los Angeles City Wastewater Project have been documented in Chapter IX. Three major strategies for mitigating secondary impacts are considered in this section: (1) the additional impact reductions that could be achieved by altering current policies or development regulations; (2) improvements or changes in urban passenger transportation facilities and services that will not alter the land-use pattern projected in conformance with existing policies, regulations, and trends; and (3) the policy and technology combinations that can be developed to improve source emission controls either directly through the City or through interagency cooperation.

One main emphasis throughout this mitigation discussion is the relative improvement in air quality through reduction of VMTs in the Los Angeles City Service Area.

b. Underlying Assumptions and Considerations. The following underlying assumptions and considerations are incorporated into the mitigation assessment to establish a basis for further discussion:

- The Study Area already has a major urban infrastructure, which should continue to be a focus for new development.
- Many actions already have been taken by local governments, as well as regional and state agencies, to begin rectifying anticipated problem conditions. Regional issues have been discussed under the leadership of SCAG and ARB: local governments in the Los Angeles Service Area have participated. The Rapid Transit District (RTD) busline has

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been completed through the Service Area and local communities have generally adapted their comprehensive plans to recognize the prospective importance of areas near RTD stations. Extensive dedications and designations of land to open space uses have been made.

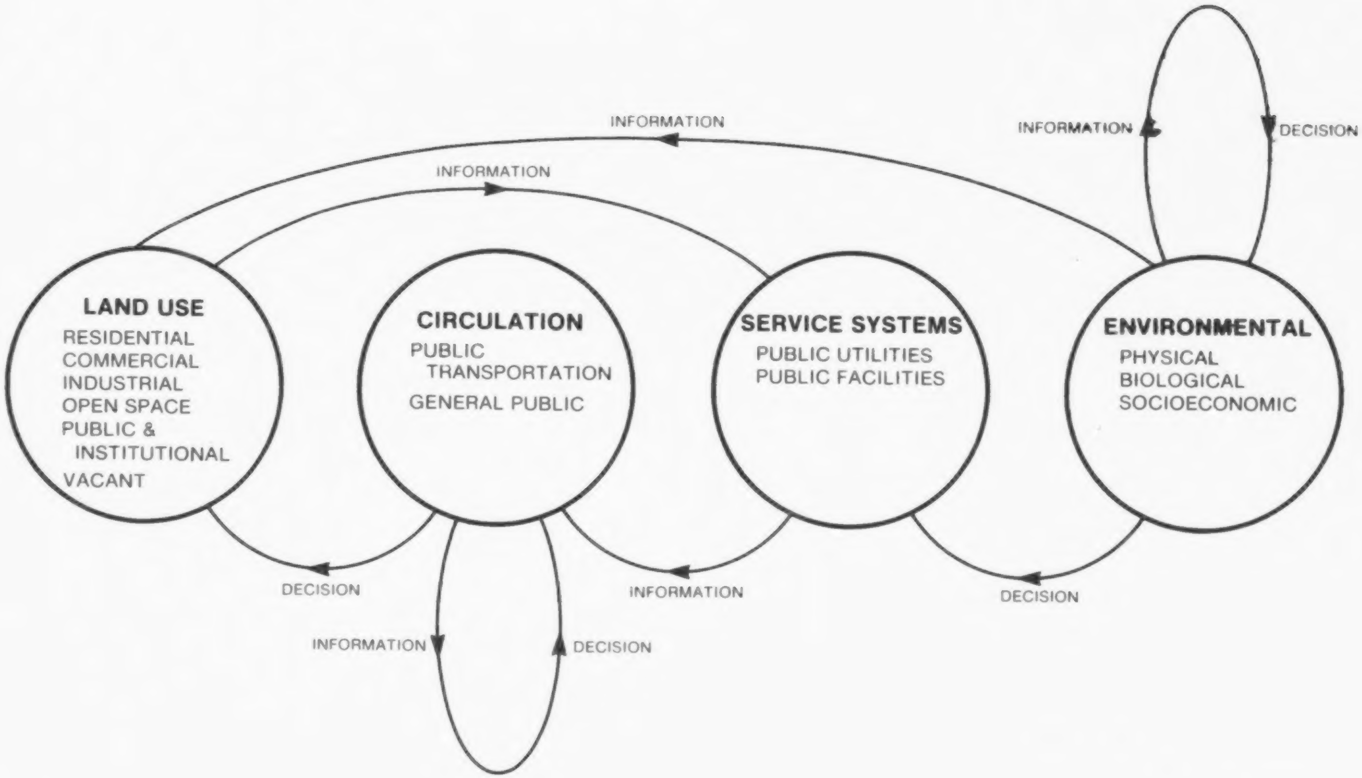
- Mitigation actions will be ineffective unless they are conceived and applied as an integrated group, with concentrated attention given to the timing and sequence in which specific elements are applied. Single-purpose mitigation actions, applied individually without relation to a group of actions, cannot be as effective as integrated ones.
- Current and projected air quality problems cannot be resolved in the immediate future. A longer range approach which effects the total transportation system, the daily movement patterns of people, and the organization of land use is required under the Air Quality Maintenance Plan (AQMP).
- Actions that depend solely on technological approaches are insufficient. The most urgent need is establishment of intergovernmental and interagency procedures which enable the planning, coordination, funding, operating, and overseeing of actions needed to mitigate adverse impacts.

c. Responsibilities of the City of Los Angeles. Although some general mitigation measures are beyond the authority of the City of Los Angeles, City residents and their representatives have the responsibility to participate in and promote regional efforts toward achieving air quality goals. The basinwide achievement of air quality goals will be realized only through the overall integration of transportation, land use, environmental, and public service planning, combined with political support from responsible officials and the electorate. Figure X-1 illustrates the partial information and decision flows that are involved in such integrated planning. The failure of such integration on a regional scale has promoted and continues to promote environmentally unsound development.

In summary, the City's two basic responsibilities are:

- To cooperate with and promote intraregional measures that will improve the overall air quality of the South Coast Air Basin.
- To identify and implement intracity measures that will incrementally improve air quality conditions for City residents without detrimentally affecting other communities and residents within the Basin.

The achievement of both these goals will require full appreciation of the City's relative importance in the SCAB as well as a cognizance of cost-effective focusing of mitigative measures.


LAND USE
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SERVICE SYSTEMS
PUBLIC UTILITIES
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Figure X-1. Information and decision flow required for integrated planning within the City of Los Angeles.

2. DEGREE OF MITIGATION REQUIRED FOR SECONDARY AIR QUALITY IMPACTS

Consistent with the EPA's responsibility to ensure that federally funded projects do not contribute to the degradation of air quality and the potential constraining effects of wastewater treatment capacity, the level of mitigation required for the service area is the difference between emissions associated with no service area growth and emissions associated with SCAG-76 growth. This would place the responsibility on local agencies to reduce RHC emissions in 1990 by 40 tons per day of RHC and 38 tons per day of NO_x under Alternatives B4C, C3, and E2. By the year 2000, mitigative reductions of 51 tpd for RHC and 47 tpd for NO_x would be required. Figure X-2 shows 1974 and expected emission levels in 1990 for the service area and for the SCAB under the various growth and no-growth scenarios.

3. MITIGATION STRATEGIES

This section includes certain measures that could be applied by the City and other measures that would require a more regional application. It must be emphasized that resolution of the existing poor air quality conditions within the South Coast Air Basin is beyond the City's control and ability. As noted in Section X.C.2, the City's growth will contribute approximately 20 percent of the difference between the no-growth and the SCAG-76 growth-related emissions.

Based on the concepts and assumptions discussed in preceding sections, an overall strategy was developed for mitigation of negative secondary impacts associated with Los Angeles and South Coast Air Basin growth. Major elements of the general strategy include:

- Land-use planning, zoning, and utilities design and planning to control the magnitude, schedule, and location of growth.
- Policies specifically designed to minimize high energy consumption and concomitant degradation of air quality.
- Interurban and intraurban transportation facilities designed to reduce VMT and emissions.
- Source emission controls through legislative mandates and application of technological innovations to directly reduce both stationary and mobile emissions.
- Planning and construction measures designed to minimize emissions through materials use and technological innovation.

Growth management can operate through any of the measures to alter present or projected individual decisions where the combination of those decisions is found to produce detrimental external effects.

Specific strategies designed to focus growth with minimum detrimental environmental impact were identified in Chapter IX. The degree of effect

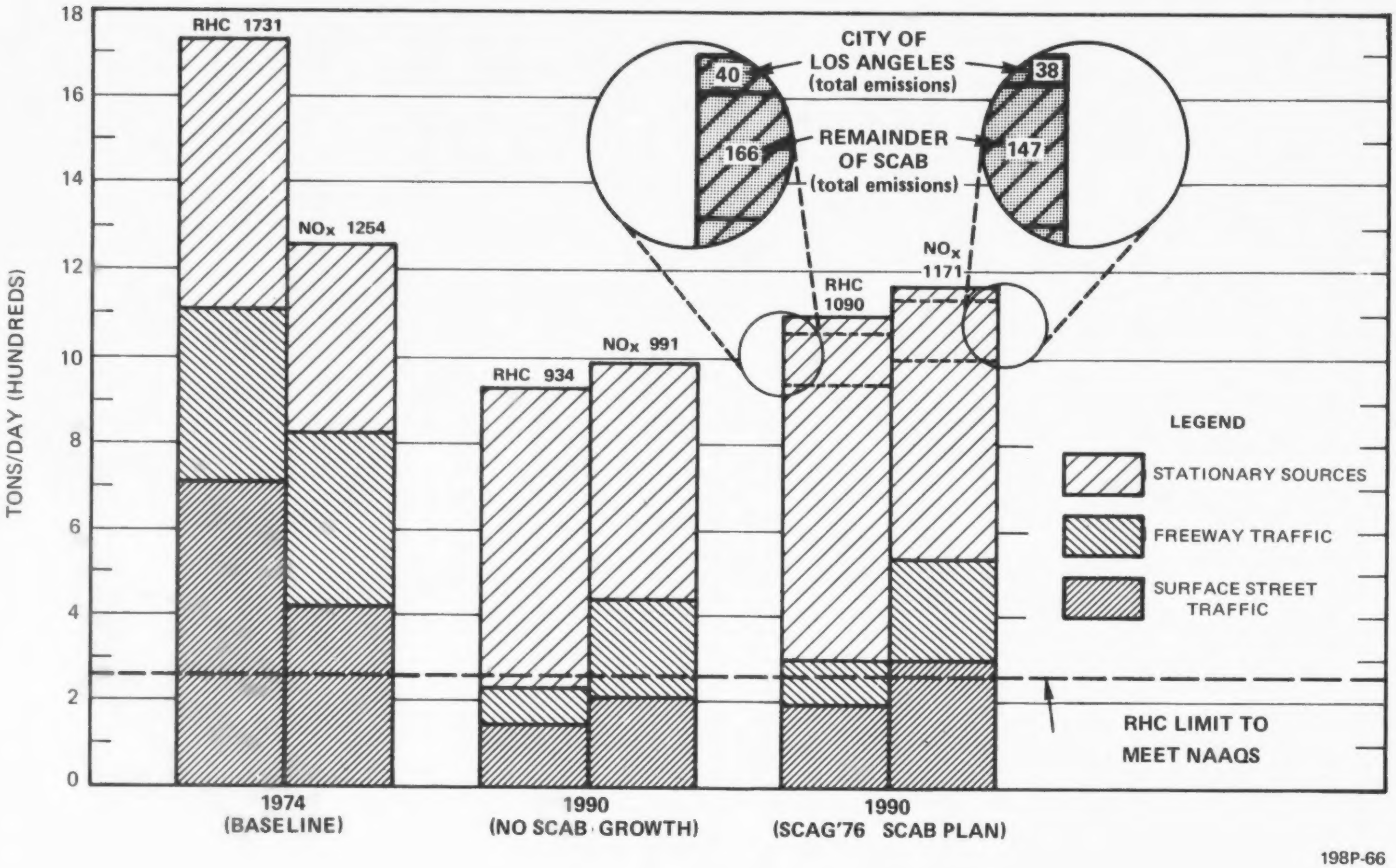

Figure X-2. ARB projected emissions.

the majority of the measures would have in controlling and channeling the projected growth over the planning period within the City of Los Angeles was estimated to be minimal on a citywide scale. On an intracity scale, wastewater treatment and transportation corridors, approaching and exceeding capacity respectively, in and to the San Fernando Valley, were found to have potential for growth control.

4. MEANS AND EFFECTS OF CONTROLLING AND CHANNELING GROWTH

a. Introduction. In recent years, the concept of growth limits has been taken from the realm of theoretical conjecture to the arena of practical application. In the process, unanticipated problems have emerged that have resulted in a more complex issue than projected by earlier analyses. A separate literature on the subject is accumulating, and numerous cities across the nation either have implemented or are deliberating the use of growth management techniques. In a recent survey by the Southern California Association of Governments, two of three responding counties and one-third of 97 Southern California cities indicated that they were working or considering work on growth policies (Southern California Association of Governments, 1975).

Although the EPA is in no way advocating limiting service area growth, such limitations could be explored by local agencies as potential means of channeling growth in a manner that would contribute to the necessary mitigative reductions in adverse secondary impacts that would otherwise result.

As debate on the subject of growth management has spread, the number of new techniques used to apply growth limits has increased. They all produce an impact on some form of growth: either the size, timing, location, or the nature of such growth. Growth management methods also regulate either the date or the absolute amount of growth, but many can be used to accomplish both, depending on the extent to which they are pursued and the length of time they are in force. It is therefore difficult to separate growth management approaches according to their effect on the rate or on the amount of growth. This discussion will focus on growth management strategies grouped according to the major entity on which restrictions could be directly placed by the City of Los Angeles: community facilities, housing, land, or economic opportunities. In addition, a separate category or more indirect or subordinate measures will be presented. The more successful growth policies would combine techniques from each of these groups to match the unique circumstances and needs of the San Fernando Valley, the western portions of the City, the central area, the harbor, the City as a whole or the region up to the entire South Coast Air Basin.

b. Growth Limits due to Restrictions on Community Facilities. Limitations on growth imposed through the restricted delivery of community services have involved such facilities as sewage treatment plants, trunk lines, water delivery systems, schools, roads, and parks. Extensions of these services have either been temporarily suspended, as in the case of sewer line moratoria, or have been scheduled for completion under a master plan for phased development. Several communities in California and across the nation have utilized different versions of this technique.

The most well-known case involves Ramapo, New York, 35 miles north of New York City. Ramapo officials attempted to limit its rate of growth to the level where housing construction was commensurate with adequate public facilities and services. A capital improvements plan was designed to be completed over 18 years in which community facilities were phased for completion in different areas of the city over that time period. Building permits were then issued by a point system based on the proximity of the proposed development to existing facilities (the closer to services, the higher the number of points). Land not immediately intended for capital improvements received a lower tax assessment until such time as development could occur. In some cases, a developer could install the required community facilities and proceed with construction. In any event, the entire community was scheduled to have public facilities provided by the phased capital improvements plan at the end of the 18-year period.

The Ramapo method affects only rental housing, and adequate school facilities are not among the required existing facilities of the point system (Cutting, 1976). In order to qualify for a permit, developments must attain 15 out of a possible 26 points, making it unnecessary to have all completed facilities within a very short distance of a proposed construction project (McAlevey, 1974). This method phases ultimate growth to coincide with provision of adequate public services and is not intended to halt growth altogether. It attempts to accomplish growth management without the introduction of arbitrary or subjective criteria to the process. The growth policy is nonexclusionary since low-income housing is not subject to the point system. While the courts have generally upheld the Ramapo technique because of its comprehensiveness, provision for low-income housing, and lack of arbitrary restrictions, the City of Los Angeles and other California communities facing single family development may find this method less workable than would cities in other states. The authority for timing controls is not present in Los Angeles City zoning regulations and the public services whose development is phased in Ramapo are phased to meet, not channel, growth in the City of Los Angeles. In most California cities, timed development will not be a deterrent to escalating construction already occurring (Comprehensive Planning Organization of the San Diego Region, 1974). This method is viable chiefly where large amounts of vacant but developable land exists although in areas facing major redevelopment, such as the Central City, a modified point system could be applied.

The mandatory provision of adequate public services has been instituted on a county level by Montgomery County, Maryland. The county enacted a moratorium on sewer extensions and hookups in 1972 to last until adequate sewage treatment facilities become operable. Building permits cannot be obtained without sewer extension permits. Growth controls are channeled through a 10-year water and sewer plan and an adequate public facilities ordinance. The county must establish a water and sewer plan within a defined service area and, in conjunction with a capital improvements program, schedule extensions of county public facilities such as roads, schools, parks, and sewer and water facilities. The ordinance requires that the developer prove the existence of adequate facilities prior to building, in accordance with the definition of adequate supplied by the county. The builder must also demonstrate the availability of necessary community services whose provision is not the responsibility of the county. In addition to phasing in of community services, the county utilizes two other complementary techniques. To encourage residential and commercial development where it is desired and can be accommodated by existing and proposed facilities, new zones have been created to encourage development in downtown central business districts. At the same time preservation of rural areas is fostered through large lot zoning and preferential tax treatment of farmland.

A growth policy based on the delivery capacity of essential urban services has also been enacted on a regional scale in Mid-Willamette Valley, Oregon. Sixty-six percent of Oregon's population lies within the broad valley which encompasses Marion and Polk Counties and the City of Salem. The complexity of reaching agreement on a growth plan covering these jurisdictions required extensive citizen participation and public hearings. After three and a half years of debate and work, Valley citizens decided on a plan called an urban services boundary. The purpose was "to contain urban type development in planned urban areas where basic services such as sewers, water facilities, police, and fire protection (could) be efficiently and economically provided" (Kvarsten, 1974). The three governmental jurisdictions collectively agreed on a boundary within which urban services could methodically and prudently be extended for urban development. The timetable for provision of these services was to be coordinated with service district boundaries, the comprehensive plan for the region, and desirable land use and transportation patterns. Outside this boundary, low-density residential and open space lands are to be maintained. Implied in the plan is an expectation that the City of Salem will expand through orderly and planned annexation and increased coordination among the jurisdictions to ensure improved service delivery as population growth continues.

Novato, California, has instituted a plan resembling Ramapo's point system, with minor differences. Finding itself in a situation similar to Ramapo's, where growth was a function of its proximity to a larger urban area, in this case the Bay Area, the city attempted to introduce some rational and planned sequencing to its growth patterns. Novato officials elected to employ a point system for residential development based on an inventory of available land, expected housing demand, and capital improvement budgets of government agencies connected with service provision. The point system is augmented by a weighting process and together determine the total scores of proposed developments. Low-income housing is included in the point system and given weighted values.

In California several areas have tied development to the delivery of water. Santa Barbara's two County Water Districts, Montecito and Goleta, have proclaimed almost total moratoria on new water line hookups. Cessation of development has not occurred since those areas with a water entitlement or with private wells have been permitted by the County to develop and some additional private wells have been drilled. Both Montecito and Goleta also have exemption procedures in hardship cases.

A water moratorium on the county level was enacted by Marin County long before it became the first California county to also enact water rationing in early 1977. In 1970, a county ballot proposition to appropriate 12 million dollars for water district improvements narrowly passed. In 1971, another proposition that would have increased the water supply brought into the County failed by a nine-to-one vote after publicity indicated that the expansion of services such as water supply greatly encouraged development that Marin County neither wanted nor could afford. This defeat led to a reshuffling of members of the Marin Municipal Water District Board, which eventually enacted a moratorium on water hookups. All new pipeline extensions have been denied to developers, while variances have been given to individual hardship cases.

The crucial issue with water and sewer service districts is whether public utilities have the legal authority to deny extensions of their services. Legal settlement of the issue has never been definitely resolved, but it seems unlikely that courts would mandate provision of services when voters deny extensions and retain voting power to remove the officials in charge. The courts have shown some reluctance to overturn decisions based on electoral mandates (Stanford Environmental Law Society, 1973). For this procedure to be effective, regionwide coordination and agreement among all agencies responsible for water permits must be accomplished. Also, water moratoria which single out only one kind of development (i.e., residential) overlook the other influences that prompt demand for increased growth, such as continued industrial and commercial expansion, and thereby encourage sprawl and long commutes with concomitant detrimental effects on environmental quality.

Local governments do have certain limited powers over those utilities that they do not operate (e.g., granting franchises to private utilities, police power over operating procedures). The only specific controls given by state legislation over private utilities, though, is through the process of subdivision regulation (Stanford Environmental Law Society, 1973). Outside of those powers, local government control of the policies of private utilities is limited. It should be noted that while state and federal governments operate as equals under the constitutional principle of federalism, local governments are subservient to state governments exercising only those powers granted by the state. State law directly authorizes utility regulation through county or city building regulations (California Government Code 53090 et seq.). This provision is limited in that it does not apply to local agencies producing, storing, or transmitting water or electrical energy. The statute gives such power over major utilities such as sewage to local governments. The City of Los Angeles is in the unique position of having control over utilities that normally are provided by special districts including water, power, and wastewater treatment.

The power given to local governments by these statutes can be used to exert some influence on the policies of private utilities and special districts. For example, strict standards for services in subdivisions may increase the costs of development and thereby discourage some utility extensions. Also, regulations of the size of utility expansions regarding new subdivision developments may help control growth. The power to prevent the extension of utilities, particularly private utilities regulated by the Public Utilities Commission is unclear and doubtful.

c. *Limits due to Restrictions on Housing*. In some cities, the campaign for control of growth has been shifted to the sphere of housing, or to housing plus restrictions on additional facilities. The concept suggests that controlling the number of housing units ultimately determines the number of people who live in a given jurisdiction. This type of measure is relatively simple to enact and much less complex than a growth plan requiring coordination among diverse governmental entities.

The most comprehensive of this type of growth policy is that established by the City of Petaluma, California. At the time the growth policy was enacted, schools in the eastern half of the city were on double sessions, the town needed a new water aqueduct, and the city had been ordered to make costly additions to its sewage system by the Bay Area Water Quality Control Board (Mocine, undated). In addition, development was occurring on the outskirts of the urbanized area when vacant land near the center was available. The proximity of Petaluma to the San Francisco Bay Area was one of the major causes of its growth of 77 percent over 10 years. The rate of growth ultimately adopted still exceeded the growth rate for Sonoma County and for the nine counties surrounding the Bay Area, although it substantially reduced the rate of the previous years.

The Petaluma growth plan had four main elements. The first element was the establishment of an official development policy which laid out the general guidelines of future development over the next five years. It emphasized a permanent limit on town boundaries and a bordering greenbelt, a balance of development between the east and the west sides of town, and the intention to maintain a small town character while developing at a rate commensurate with the capacities of essential urban services. The second element specified the method to curtail the rate of growth: the housing quota. In conjunction with the General Plan, a series of Environmental Design Plans were drawn up which detailed the type, location, and quality of development desired in Petaluma. These plans limited development projects with more than 5 units to a total of 2,500 units over the five years of the plan, or 500 per year. In addition, the location of annual development was firmly established within the city's boundaries. All landowners were given a clear understanding of when their property would be developable under this system. The third element was the formation of a residential development evaluation board composed of two city council people, two planning commissioners, three business or professional people, one member from each school district, and six citizens. A point system was created by which this board evaluated development proposals in terms of the capacities of utilities and public services, the quality of design, the amount of low-income housing, and conformity with both the General and the Environmental Design Plans. The fourth element was the generation of a Housing Element to the General Plan which quantified the housing situation in Petaluma and offered policy suggestions.

One of the largest advantages of this plan is its confirmation by the Supreme Court as a legally acceptable slow growth policy. The Court, in upholding the city's appeal, found the plan to be comprehensive, nonexclusionary, and lacking an essentially arbitrary nature. The plan does, however, also lack a regional context and practice. It fails to grapple with the problem of growth outside its jurisdiction, and until recently had not succeeded in obtaining Sonoma County support. The quota aspect has greatly encouraged vigorous competition for better quality developments (Comprehensive Planning Organization of the San Diego Region, 1974).

The community of Boca Raton, Florida, enacted one of the earliest and most simple growth control techniques, in 1972. The city adopted an ultimate capacity of 40,000 dwelling units through beachfront acquisition, minimum lot sizes, and a reduction of the percentage and density of apartment units. Indications since the start of the program are that demand for housing and building permits have increased in the face of an absolute ceiling and housing prices have risen by 250 percent (Comprehensive Planning Organization of the San Diego Region, 1974). Considering the dramatic rise in housing prices nationwide, it is not known how much can be attributed specifically to the housing limit in this city.

On a less comprehensive and more piecemeal basis, San Diego has instituted a modified downzoning system in which outlying areas have been redesignated from residential to agricultural uses. The disadvantages are that it is not a citywide policy, does not deal comprehensively with the different aspects of growth, and fails to consider the complex causes of growth. It has simply declared a moratorium on housing construction *per se* on certain peripheral land areas.

A study prepared by the Santa Barbara County-Cities Area Planning Council determined that used alone, quotas or total capacity have limited success, and may actually result in the production of other environmental impacts. Such policies represent an attempt to counteract the result, not the causes, of growth, and as such, shift growth problems to adjacent jurisdictions without growth limits. Unless mandatory construction of low- and moderate-income housing is part of such growth policy, the poor and the elderly eventually find themselves pushed out of the price competition. Unable to afford moving expenses as well, the poor double up and the result is sometimes an increase in overcrowded and substandard conditions. Some observers contend that housing quotas or capacities do cause emigration of a population group whose businesses and income are a mainstay of most local economies: the moderate-income families and individuals (Santa Barbara County-Cities Area Planning Council, 1977).

d. Limits due to Restrictions on Land. Growth policies which use restrictions on land as the major inhibitor of increased growth are the most complex and cover a wider spectrum of possibilities. Some of the growth policies discussed above overlap with plans advanced under the heading of land use controls. Land as the basic commodity has attracted the broadest range of ideas on how to restrict its use.

One of the primary techniques restricting the uses of land is open space acquisition. Most urban growth is the result of conversion of rural or open space lands to residential uses. Preserving open space then can be a deterrent to rapid growth and/or sprawl. There are several methods proposed or used to maintain open space and greenbelts. Boulder, Colorado, and Palo Alto, California have utilized two.

Boulder, as the home of the University of Colorado and numerous research and electronics firms, experienced rapid growth in the 1950s and 1960s. Because of its semiarid climate, the potential for water problems connected to the increasing growth soon became apparent. In the 1800s, Boulder was given 3,000 acres of foothills surrounding the city by the federal government. In 1958 the city charter was amended to forbid the provision of city water services beyond a certain elevation, preserving the highest areas of the foothills and instituting an urban water services boundary around the city. By 1968 a full-scale open space preservation plan was in effect. A 1 percent sales and use tax was established from which the collected revenues were used to acquire greenbelts and scenic easements on and within the city's borders. The areas acquired are left in a relatively undeveloped state for activities such as hiking, horseback riding, and picnicking. This is the main element of Boulder's growth policy that has since expanded and been augmented. Rules prohibiting intensive development in floodplains and on steep slopes have been added, as well as a policy of private financing of new sewer and water hookups. Fifteen percent of development projects must be allocated for low- and moderate-income housing units. Commercial and industrial developers have also felt the pinch of paying for expansion with the enactment of a park and open space fee of 0.5 percent of new building costs (Santa Barbara County-Cities Area Planning Council, 1977). The program has the support of both the city and the county and is jointly administered by both.

Palo Alto has taken a similar but more radical approach to the preservation of its neighboring foothills. Utilizing cost-benefit analysis, this university and electronics-firm town, estimated that the cost of intensive development of these foothills would not be economically, aesthetically, or socially affordable. The method employed to preserve the foothills was downzoning to minimum lot sizes of ten acres. While this left little realistic possibility of extensive residential development, it did allow for uses such as golf courses and farms.

Legal questions surround the use of large lot zoning as an acceptable growth control method. It appears that the technique must be used with careful attention to individual circumstances. The fact that Palo Alto has applied downzoning only in the foothills, whose steep terrain would preclude the possibility of any substantial development, has apparently left the ordinance nonexclusionary in the courts' minds. However, Palo Alto also had an active low-cost housing program in the remainder of the city which may serve to compensate for any exclusionary bias in the downzoned foothills. Another legal debate is whether the substandard downzoning so deflated the potential development value of foothill property that the downzoning represented an extra legal "taking" of private land by the city.

Coon Rapids, Minnesota, a suburb of Minneapolis-St. Paul, instituted an open-space acquisition policy by establishing a development district with firm boundaries. Landowners were served notice that neither subdivisions nor utility extensions would be permitted beyond the boundary where only minimum lot sizes of 5 acres were allowed. Inside the boundary, enough land had been allocated to accommodate desired growth to the end of the century. The action has reduced the community's growth rate, halted leapfrog development, and maintained desired open space on the northern undeveloped boundary (Cottingham, 1974).

Land banking is a close relative of open-space acquisition. Under this method, a jurisdiction purchases or condemns land until development is needed or desired. The land is then sold or leased at which time the governmental unit which purchased the land begins to recoup the large expenditures of money which it laid out. The magnitude of the initial capital outlay prevents this technique from obtaining more widespread acceptance by communities.

A relatively new concept is that of "transferable development rights." Traditional land use controls assume that the development potential of a site may be used only on that site. This new concept proposes to break this linkage between a piece of land and its development potential by permitting a transfer of the development rights to land where greater density is not objectionable. Under this concept, all land would be initially assigned the same number of development rights per acre. Then a plan would lay out zones for low, medium, and high density development. Landowners in high density zones, needing more rights in order to build to permitted levels, would buy those rights from landowners in low density zones. Thus, development rights would be bought and sold on the public market. One substantial benefit for the community is that land from which the development rights are sold would be effectively preserved in low density or open space use without cost to the public.

A local government could also use the concept of "transferable development rights" as a method of regulating the timing of community growth. After setting a desirable general rate, as well as the locations in which development is to be retarded or encouraged, a local government would issue the number of development rights each year which equals the rate of growth desired. The issuing agency may hold one block of rights to be used to encourage development in specified areas for other types of explicitly defined and socially desirable development.

Transferable Development Rights (TDR) have been put into actual practice in very few locations. Several areas have considered their use, only to revert to some other method, or have ultimately instituted TDRs on a purely voluntary basis. Chicago once considered it to rescue their diminishing historical sites but eventually chose to use a system of density bonuses instead. In Los Angeles, TDRs are sanctioned in some of its 35 planning areas, such as Westwood, but for the technique to be useful, it must be instituted and firmly established in the City zoning regulations (Southern California Association of Governments, 1975). While the TDR concept involves a good deal of comprehensive planning to establish where and how fast growth should occur, it also presupposes a substantial amount of police power to enforce it.

Traditional zoning ordinances are an attempt to control land use by determining prior to development the ultimate use of each land parcel. To assure that proposed development satisfies the designated land uses, most communities have also adopted laws for the review of major development proposals. There is an increasing recognition that development proposals must be examined on an individual basis under a system of review that has clearly defined standards and the flexibility to encompass changing community values and the special characteristics of each project. For example, Environmental Impact Statements under the National Environmental Policy Act (NEPA) and Environmental Impact Reports under the California Environmental Quality Act (CEQA) require that governmental agencies review in a public document the impacts of the project they are considering. CEQA also requires that significant private actions be similarly reviewed.

Walnut Creek, California, insists on city assessment of EIRs on development projects that might have impacts on the physical environment, public facilities, or the economic health of the community (Dunne, 1974). The reports are used to change parts of, or deny whole, development projects if adverse impacts cannot be adequately mitigated. Some results have been major park or sewer improvements financed by developers and the identification of hazardous or troublesome problems. Some smaller communities have used EIRs to reduce the rate of growth even more by mandating that the Planning Department conduct all such reports on development projects. The size of staff and amount of time required to generate an EIR necessitate a much slower rate of housing construction for large projects.

e. Limits due to Economic Restrictions. Some growth plans have attempted to affect the root cause of growth—economic expansion. People stay in an area or move to an area chiefly on the basis of employment opportunities. Certain communities, in recognizing this fact, have developed growth policies that reflect the existence of economic expansion and its role in the encouragement of development. Disincentives which discourage the expansion of existing industries or which make relocation to an area undesirable can be employed in several forms. Some of these include reducing the amount of land zoned for commercial and industrial use, a cessation of advertising for new industry, production taxes, high commercial and industrial property taxes, and taxes on increased work forces or factory size. Combining these with other techniques in accordance with the particular needs of a specific area can help determine the number of people contributing to the demand for housing. Two plans which utilize economic incentives and disincentives are the method considered by Boulder, Colorado, and that employed in France.

(1) DESCRIPTION OF ELEMENTS. Boulder's proposed scheme is the Employment Opportunity Tax. It applies to firms of ten or more employees. Companies are taxed between 2 and 10 percent of the wages paid to every employee after the first ten. The system does not accommodate flexibility as well as envisioned and is likely to encounter stiff resistance since it would apply equally to existing and future businesses.

A second, more flexible and comprehensive method is the French Incentive/Disincentive System. An adaptation of this system could be incorporated into a city growth plan using three main elements:

- A detailed study that would divide the city into zones according to each area's potential for development. Among the criteria used for determining this potential are socioeconomic information and the desire for development on the part of people residing in each zone.
- A system of incentives and disincentives which can be applied in each zone in a manner that encourages or discourages industrial, commercial, or governmental growth according to the potential determined in the first element.
- A package of specific techniques that will phase acceptable growth within each zone. These could include zoning, taxes, and time schedules for extensions of public services.

(2) APPLICATION OF ECONOMIC RESTRICTIONS. The proposed incentive/disincentive system would need to operate for a specified period of time, of at least a decade, with a review and perhaps minor revisions every three years. Every area in the city would fall into one of four major zone categories:

1. Deferred Development Areas—no development would take place.
2. Limited Development Areas—minor development and an annual growth rate between 0.5 and 1 percent could occur.

3. Moderate Development Areas—continued expansion under an annual growth rate between 1 and 1.5 percent would be established.
4. Preferred Development Areas—a growth rate in excess of 1.5 percent per year would be promoted.

The identification of a community or area with one of these categories would be based upon a study of local socioeconomic factors, the goals and preferences established by its residents, and a determination of its development potential. Review of the system would be made every three years at which time changes in zones could be made by an area or community if it so desired. These provisions allow for self-determination within a regionally applied growth management system, and for flexibility within each community's self-selected level of development.

A package of techniques would be available for adoption by each community to effect the level of development chosen. They will range from steep taxes and highly restrictive zoning in Deferred Development Areas to tax exemptions and development of industrial parks in Preferred Development Areas. Each area could be presented with alternative packages of incentives and disincentives which are consistent with neighboring packages and are related to existing land use. The community could select the combination of incentives or disincentives it wants to achieve the desired degree of development. Measures that will encourage the type of industry and/or development consistent with an area's environment and social goals would be identified and instituted. Table X-1 indicates some of the tax measures which could be utilized to achieve the differential growth levels. While taxation applied to a growth management system is a complex matter, it has been established as a major determinant in industrial locational decisions.

The entire system would require intragovernmental cooperation on a citywide basis with support from contract cities and the county. This system would leave essential decisions to the local electorate. Although such a plan would require time and public discussion to implement, it presents an example of a growth policy that combines flexibility and local decisionmaking while using the basic causes of growth to focus development in an environmentally sound manner.

f. Indirect Restrictions on Growth. In addition to the techniques devised to specifically deal with growth management, there are traditional planning methods, sanctioned by enabling legislation, that can be, and have been used to deter increasing growth.

g. Preferential Assessment. Preferential taxation is a method of subsidizing land such as farms, forests, or historic districts from which the community receives an aesthetic, unquantifiable benefit (Economic Research Service, U.S. Department of Agriculture, 1974). Preferential assessment programs are often adopted in order to preserve current

Table X-1. Potential application of incentives and disincentives for development in the Hyperion Service Area and the City of Los Angeles.

COMMUNITY PLANNING AREA GOAL	DEFERRED DEVELOPMENT	LIMITED DEVELOPMENT	MODERATE DEVELOPMENT	PROMOTED DEVELOPMENT
	ALL DISINCENTIVES	MILD DISINCENTIVES	MILD INCENTIVES	ALL INCENTIVES
Specific Application: Building Permits	Building Permit Restrictions, High Building Permit Fees	Building Permit Restrictions, Moderate Building Permit Fees	Limited Building Permit Restrictions Limited Building Permit Fee Exemptions	Minimum Building Permit Restrictions, Building Permit Fee Exemptions
Land Use	Land Use Restrictions, Preferred Taxation on Agricultural Land	Limited Land Use Restrictions Preferred Taxation on Agricultural Land	Limited Land Use Restrictions	Land Use Concessions
Business Activities	Business Activities Tax, Equipment and Facilities Tax	Gross Receipts Tax	Business Tax Exemptions	Grants, Business Tax Exemptions Development of Industrial Parks
Additional Personnel	High Additional Personnel Tax	Low Additional Personnel Tax	No Personnel Tax	Promotional Campaigns To Encourage Labor
Utilities Availability	High Utilities Cost, Restricted Utilities Availability	High Utilities Cost, Utilities Available	Medium Utilities Cost, Utilities Available	Low Utilities Cost Excess Utility Availability

desirable uses of land. Recognizing the possible loss of local tax revenues, California and New York have passed laws instituting reimbursements for localities which suffer a loss as a result of preferential assessment (Council on Environmental Quality,1975). There is some question, however, as to the effectiveness of preferential taxation in accomplishing desired goals. An analysis of California's Agricultural Preserve Act, the "Williamson Act," indicated that the land under an Agricultural Preserve Contract was more than 10 miles from the nearest incorporated area (Carman and Polson, 1971).

A problem with preferential assessment is that the landowner could be assessed at a lower rate, but later decide to develop. By delaying development while taking advantage of preferential assessment, the landowner would have saved a substantial amount in property taxes. In order to avoid this problem, most states have established conversion penalties or recapture provisions to reinforce the incentive to preserve the land in its current use. A step beyond the penalty is a requirement that any landowner desiring preferential assessment sign a contract to keep the land undeveloped for a certain number of years. It is automatically renewed annually unless either party to the contract requests nonrenewal. If the contract is not renewed, the assessment is gradually increased to the market value as the number of years remaining in the contract decreases. Because the contract effectively restricts those who might seek to sell their land in the foreseeable future, owners near urbanizing areas are less likely to take advantage of the preferential treatment than owners of more remote land.

The Council on Environmental Quality has concluded that the preferential assessment programs have had mixed results in achieving their objectives. Because of the popularity of this land use control technique and concern over how it can be made more effective, the Council has initiated studies to develop recommendations on improving the effectiveness of these controls as a growth control mechanism (Council on Environmental Quality, 1975). The lack of acreage within the City of Los Angeles that could be given preferential taxation makes this a dubious tool in growth management.

(1) ANNEXATION. The control over the annexation process in California allows both the Local Agency Formation Commission (LAFCO) and local municipalities to deter development and consequently limit or control growth. LAFCO must approve an annexation proposal before a city may begin annexation proceedings (California Government Code Section 35002). It has very broad powers to deny or amend such proposals after holding a hearing on its merits. Each LAFCO has the power to adopt its own standards for evaluating annexation proposals, although the statutes do specify certain factors for LAFCO to consider (California Government Code 54796) including the probable population growth in the area, the availability of public services, the proposal's conformity with the appropriate general and specific plans, and the social and economic effects of the annexation on adjacent areas. LAFCO is empowered to

reject annexation proposals on the grounds of the ill effects of the growth caused by the annexation if approved (Cranston, Garth, Plattner, and Varon, 1973).

LAFCO must also establish "spheres of influence" for each city and special district within the county (California Government Code Section 54774). Spheres of influence define the optional future boundaries of each governing agency in the county and are factors to be considered when evaluating annexation proposals. They may serve to reinforce the power to deny annexations by showing in advance which areas have little or no chance of being annexed in the future. Thus, developers who count on getting services from the city through annexation would be deterred from building (Cranston, Garth, Plattner, and Varon, 1973).

Cities also have strong powers over annexation. They may annex county land which they believe will be developed and then restrict growth, or they may refuse to annex land intended to be developed, and withhold public services to developers who cannot obtain essential services from the county or special districts. As indicated in Figure X-3, considerable acreage exists that is currently under Los Angeles LAFCO influence in South and West Los Angeles and in the western and northwestern areas of the San Fernando Valley potential influence areas of significant size exist.

(2) REGULATION OF SUBDIVISIONS. In California, the primary authority of cities and counties to regulate subdivisions comes from the Subdivision Map Act which outlines the basic administrative procedures for subdividing (California Business and Professional Code 11500). Conditions the Act allows to be imposed on developers seeking approval can be important in controlling growth. For example, the Act expressly enables cities, with certain exceptions, to require dedications of land for school, drainage and sewage, and park facilities. This increases the developer's front-end costs and could thus discourage rapid development of outlying areas. Also, the Act enables local government to refuse to approve certain subdivision proposals under any conditions for a number of specific reasons (California Business and Professional Code 11549.5). If the proposed map or the design improvement of the proposed subdivision is not consistent with applicable general and specific plans, subdivision approval cannot be granted (California Business and Professional Code 11549.4(b)). The statute allows local government to refuse subdivision approval when such approval would result in "substantial environmental damage" (California Business and Professional Code 11549.4(e)). Although such environmental data would be hard to obtain at the local level, mainly for financial reasons, it is now available through the Environmental Impact Report (EIR) process under the California Environmental Quality Act (CEQA). CEQA contains no provision that any decisions be made on the basis of the EIR: however, when CEQA is coupled with the aforementioned section of the Subdivision Map Act, the EIR takes on additional force.

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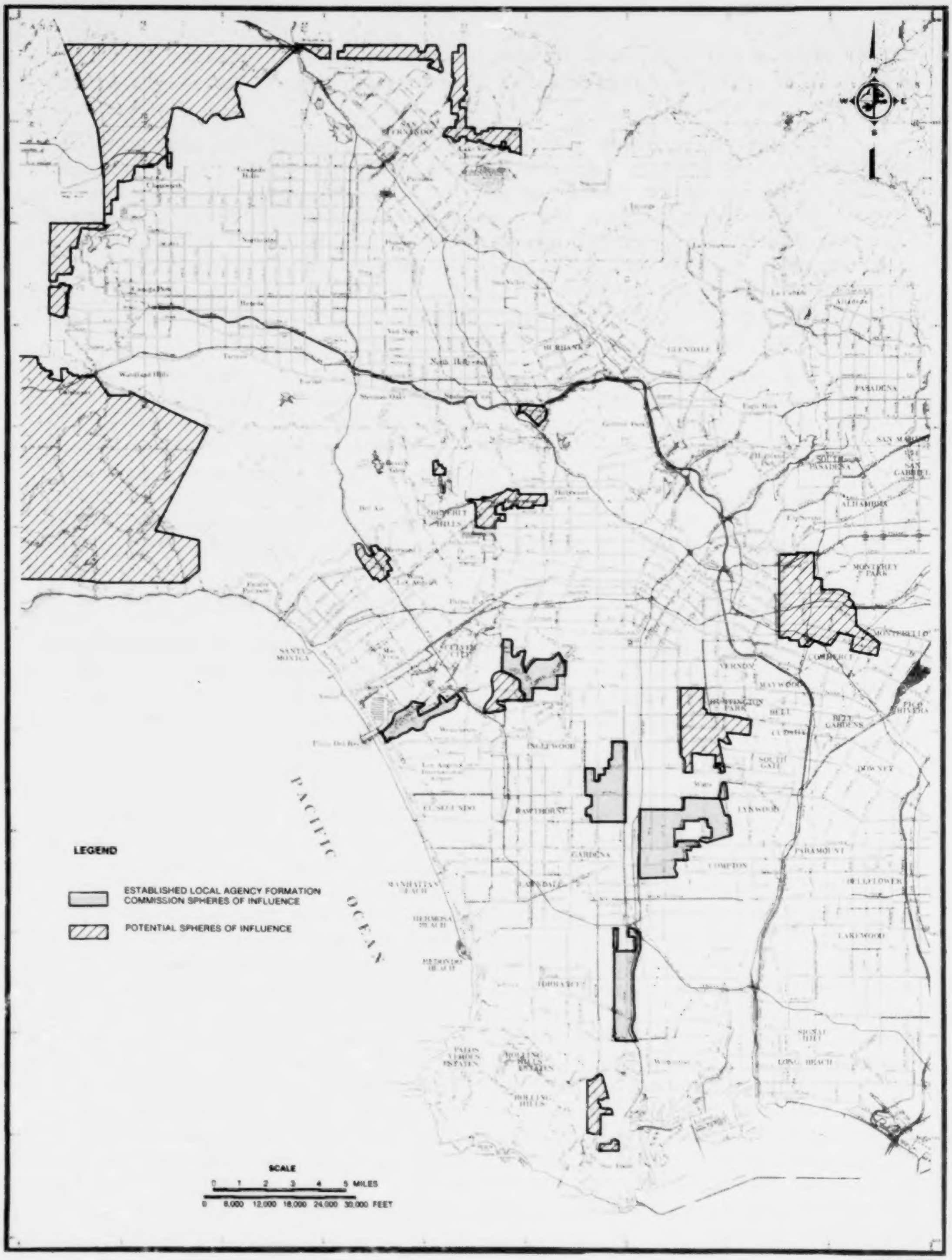
LEGEND
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POTENTIAL SPHERES OF INFLUENCE
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SAN FERNANDO
BURBANK
GLENDALE
PASADENA
SAN MARINO
SOUTH PASADENA
SAN GABRIEL
ALHAMBRA
MONTEREY PARK
MONTEBELLO
COMMERCE
PICO RIVERA
BEVERLY HILLS
SANTA MONICA
CULVER CITY
VERNON
MAYWOOD
HUNTINGTON PARK
BELL
CUDAHY
BELL GARDENS
SOUTH GATE
DOWNEY
INGLEWOOD
LYNWOOD
EL SEGUNDO
HAWTHORNE
GARDENA
COMPTON
PARAMOUNT
LAWNDALE
BELLFLOWER
MANHATTAN BEACH
HERMOSA BEACH
REDONDO BEACH
TORRANCE
LAKEWOOD
SIGNAL HILL
LONG BEACH
PALOS VERDES ESTATES
ROLLING HILLS ESTATES
ROLLING HILLS

Figure X-3. Established and potential local agency formation spheres of influence in Los Angeles and vicinity.

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Thus, the power to regulate subdivisions in California can substantially reduce the rapid sprawl of subdivisions, preserve open space, and serve as an important mechanism for controlling growth. Its utility is limited to those areas where sufficient vacant land holds potential for substantial development and is more applicable to undeveloped portions of the Basin than to the City of Los Angeles.

(3) ZONING. Zoning ordinances are designed to counteract specific problems and can also serve to inhibit unwanted growth. Historical preservation ordinances can inhibit demolition and construction activity on individual lots or entire neighborhoods by safeguarding areas or structures of historical interest. Many times aesthetic preservation provisions are built into historical preservation ordinances, allowing areas of natural beauty to be preserved under the same ordinance.

As noted in Chapter IX, such zoning techniques in the City of Los Angeles are not usually adequate to successfully manage the complexities of growth. Zoning does generate some impact on the growth process and in the framework of a comprehensive growth policy offers techniques for aiding in growth management in highly specific ways. Two examples of zoning which could be incorporated into the mitigation strategies are:

- Disaster Zoning. Disaster zoning is an ordinance that restricts building activity in areas likely to be affected by natural disaster phenomena such as height constraints. Such zoning could be applied wherever inadequate wastewater collection or treatment creates a potential or existing public health crisis.
- Cluster Zoning. Cluster zoning introduces flexibility into conventional zoning regulations. Location and density requirements can be adjusted for some developments under cluster zoning so long as the total number of units in a given number of acres does not exceed the total units per acre ratio established in a community's zoning ordinance. This concept applied in the City permits greater concentration of open space in developments and is often used to preserve environmentally sensitive areas.

A comprehensive growth policy must incorporate factors that have often been legally sustained in the past (Cutting, 1976):

1. Multidimensional Approach—Growth regulations that do not single out one goal, but rather speak to the spectrum of environmental, economic, and social impacts have more often been upheld in court.
2. Factual Analysis—A growth management plan based on informed consideration and adequate backup data sources is important.
3. Rational Basis—An important aspect of a growth plan is its foundation as a decision based on legitimate objective concerns. Those relying on nebulous qualities such as aesthetics have encountered greater legal difficulties.

4. Good Faith Efforts—Legal scrutiny has favorably considered sincere efforts on a community's part to manage growth as opposed to attempts to enact exclusionary regulations.
5. Balance—Attempts to accommodate trade-offs in a growth management plan have been accorded more favorable review.
6. Nonexclusionary Nature—A growth policy must not deny access to any particular group or class of people although limits which exclude equally across the board have been sustained.
7. Severity of Regulation—Unreasonable restrictions on property owners have generally been declared invalid unless an overriding concern such as public health can be demonstrated.
8. Mitigations—Efforts made to reduce those adverse impacts that are unavoidable have met with greater court approval of the growth plans in which they were included.

In addition, six criteria have been identified by the developers of Petaluma's growth strategy as necessary for a growth plan that is both democratically responsible and economically fair [Mocine (undated)]:

1. The growth management system must not be arbitrarily exclusionary. Since growth limits tend to encourage a rise in housing prices, it is necessary for communities with growth plans to accept responsibility for provision of low- and moderate-income housing. This will avoid preventing people of lower income from obtaining adequate housing. Exclusion of particular social or ethnic classes must, of course, be prevented.
2. The growth management system must be regionally responsible. Ideally, a community's growth policy would be tied to regional and state policies.
3. Growth management must be based on sound local planning. An adequate data base, a realistic time frame, and rational planning objectives are essential for the strength and viability of a good growth policy.
4. Insofar as possible, the effects of a growth management system must be fair to all property owners. All possible measures and mitigations must be utilized to prevent both economic windfalls and wipeouts.
5. The process must be open, orderly, and objective. Clearly specified rules, representative review groups, specific reasons in writing for project denial, understanding of time and other constraints on the building industry, and equal opportunity for large and small builders should be incorporated into a growth management plan.
6. The system must include provision for monitoring feedback, and correction. Precision in both timing and definitions

is important to the overall quality of the plan. Ongoing review and the flexibility for revisions can improve the system through experience over time and continuously reflect the changing needs and situation of a community.

These criteria were the basis of the Petaluma plan which has recently withstood a strong test of constitutionality before the United States Supreme Court.

A quality growth management policy will recognize the legitimate concerns of the competing forces behind growth and will offer a sufficiently comprehensive plan to match their complexity. What emerges from an assessment of these various alternatives is the necessity for a growth management plan to address directly the causes of growth. Growth management systems which comprehensively deal with growth through a number of techniques, rather than through a one-dimensional plan, are both more likely to safeguard rights to a larger extent and to successfully implement the results that are desired.

h. Effects of Growth Management. Because the interrelationships of community goals, economic forces, tax policies, and land use controls are extremely complex and little understood, citizens in many communities may feel that the development process is out of control, that decisions are made which benefit only the influential developers' interests and that piecemeal changes are having an unpredictable cumulative effect on the quality of life (Council on Environmental Quality, 1974). The reaction in many localities is a strong citizen effort to slow or stop growth. Communities which decide to stop growth altogether may deny some the right to a reasonable use of their land, a denial that is in violation of the Constitution unless the owner is compensated for his/her loss by the community. Also, such an approach also tends to have the effect of pushing the growth elsewhere. When such bans on development have been imposed for unlimited periods, they have been struck down by the courts. On the other hand, temporary halts on development or phased growth have had a better response from the courts (Council on Environmental Quality, 1974). The constitutionality of limited growth has recently been upheld by the U.S. Supreme Court in the Petaluma, California, decision and the approach may gain favor in other areas desiring to restrict future growth.

(1) NO GROWTH POLICIES. Many communities have imposed moratoria on various phases of development. One recent study found that nearly one-fifth of all local governments surveyed had imposed some type of moratorium, most frequently on building permits (Rivkin/Carson, Inc., 1973). Another type of moratorium often used is the one on sewer connections. Because this is usually done upon the order of state health or water pollution control authorities to prevent overloading of treatment plant capacity, they are generally upheld in court. Usually the construction of new treatment facilities is scheduled to ensure that the moratorium will be lifted in the foreseeable future. A sewer hookup moratorium

was implemented in the San Fernando Valley in the mid-1950s to slow the rate of growth but was only partially effective as many developers shifted to septic tanks.

Some communities have adopted such moratoria in an attempt to control rates or patterns of population growth (Rivkin/Carson, Inc., 1973). These actions can have some very positive effects both on the physical system of wastewater disposal and treatment of deficiencies as well as on land development patterns. For example, there is an impetus to "infill" vacant land that has been skipped over by past development although sewer connections were available at the time. Also, there is a chance that moratoria on development in suburban areas may contribute to reconcentration in central cities where sewers and other utilities are available and underutilized and where land prices may become competitive with escalating suburban costs (Rivkin/Carson, Inc., 1973).

On the negative side, building and/or sewer moratoria can and do contribute to the following:

- Encouragement of urban sprawl to jurisdictions not covered by the controls but within commuting distance of major employment centers. This can have the secondary effect of increasing air pollution in the area.
- A continuation of urban sprawl by narrowing the development alternatives to single-family housing on large tracts with septic tanks if the moratorium is on sewer hookups.
- The installation of "package treatment plants" which add to the cost of housing in the short run creates substantial maintenance and monitoring costs for the locality in the future.
- The creation of serious roadblocks to production of low-to-moderate income housing due to escalating costs of land where sites are available.
- Discrimination against apartments and other cost efficient higher density housing in some areas.
- Short-term spurts of construction to be followed by sudden, sharp drops in activity if facilities to relieve the moratoria are not forthcoming (i.e., a dangerous imbalance in housing production).
- Hardships and inequities for small builders (Rivkin/Carson, Inc., 1973).

(2) SLOW GROWTH OR TIMED DEVELOPMENT. In contrast to the difficulties with no growth policies, a number of new concepts of slow growth or timed development have been successfully implemented. The general approach of these communities has been to define a rate of expansion compatible with the desires of the community and projected growth of the

region. Their approach has also been to implement land use strategies to control new construction and direct it to designated areas in such a way that public services can be provided most efficiently (Council on Environmental Quality, 1974). Thus, the issue of growth versus no growth is rapidly becoming one of how and where and under what conditions growth should occur.

Basically, the timing and sequencing of development is aimed at ameliorating the phenomenon generally known as "urban sprawl." Urban sprawl has been defined as:

> . . . an unfettered form of urban expansion which is characterized by the initial nonuniform improvement of isolated and scattered parcels of land located on the fringes of suburbia, followed by the gradual urbanization of the intervening undeveloped areas (New York University Law Review, 1973).

This sprawl pattern has had a serious impact on the social, economic, and social well-being of both the older central city and the newer ones surrounding it. Some of these impacts include an imbalance of growth between types of uses; an inability of the community to provide public services to match private development; growing property tax rates; poor quality in the services that are provided; land speculation; and unwillingness to provide proper housing and facilities for diverse economic, racial, and ethnic groups, and irrational tax policies.

Phased growth to deal with urban sprawl can have the following beneficial impacts:

- More land is made available for agricultural and/or wildlife uses.
- Greater and more efficient density with the possibility of both housing and population mix is more likely.
- Closer proximity of jobs and residences with the secondary beneficial effects of less energy consumption and air pollution is promoted.
- Municipal control over the eventual character of development is enhanced.
- More effective timing of new residential construction with business and industrial expansion is promoted.
- A higher quality of community services and facilities because of phased expansion in conjunction with residential growth occurs.
- Reduced costs for roads and utilities would be promoted.
- Less stormwater runoff which lends to high pollution loads and erosion of exposed soil would result.
- There would be an increased viability of mass transit.

These beneficial effects of slowing growth suggest that the effects of communities to slow or stop growth will continue and probably spread. The important distinctions that must be made concerning the legal acceptance of a community's growth management policies include: (1) whether a proposed halt is temporary or permanent; (2) whether it is part of an attempt by the community to effectively plan for growth or simply an effort to stop all growth; and (3) whether it is being done in the face of a relatively large influx of development. The conclusion that must be drawn on the basis of recent court decisions is that approaches which try to predict and accommodate growth through timed or staged development plans offer considerable promise and evidently can be accomplished within existing police power authority if carefully designed to assure the preservation of property rights (Council on Environmental Quality, 1974).

5. APPLICATION OF GROWTH MANAGEMENT

The methods of growth management discussed in Section C.4 have been incorporated through the FLAG system described in Chapter IX, into a series of scenarios to evaluate environmental effects of alternative growth studies with differing air quality impacts. Current trends in the City of Los Angeles and the South Coast Air Basin—increasing size, increasing dispersion and continuing reliance on the automobile—as planned in SCAG-76 will reinforce the very urban forms and land use patterns that will increase rather than decrease environmental pollution. As development continues to disperse into low density, small-scale patterns, a number of costs are increased. Some of the costs are documented in the *Costs of Sprawl,* a study of the relative environmental and economic impacts of low-density and high-density development (Council on Environmental Quality, Department of Housing and Urban Development, U.S. Environmental Protection Agency, 1974). The conclusion to be drawn from this study is that higher density development should be encouraged to reduce economic as well as environmental costs.

On a somewhat larger scale, Alan M. Voorhees and Associates, Inc. (1971) examined the environmental consequences (primarily air quality) of alternative regional forms. Voorhees experimented with eight different urban patterns (sprawl; moderate, heavy, rotated and extreme rotated corridors; satellite cities; centralized employment with either sprawling or radial population); four highway networks (a basic arterial grid, freeways along major arterials, major radial freeways with an outer beltway and inner loop, additional radials, and an inner beltway); and three basic transit networks (bus, rapid radial rail with bus, radial and outer loop rail). Voorhees concluded on the basis of this analysis that greater clustering of employment and higher densities along radials would promote transit usage and substantially improve air quality. This evidence suggests that if environmental pollution is to be changed by changing urban form, nothing less than a reversal of present urban trends must be achieved.

As pointed out in Section C.4, patterns of growth are influenced by many discrete decisions made by individuals, families and businesses which reflect, in part, a search for better job opportunities, a better climate, a better quality of life, and a better profit-making environment. These decisions cannot be dictated in a free society; although the factors which influence these decisions at the local level are susceptible to change which, in turn, will alter emerging growth patterns. These factors were identified in Table X-1 and include specific zoning and building regulations; the approval of development plans; local tax levies; the location of public facilities and roads; the extension of sewer, water, electric and gas services; and the quality of the community environment. These strategies, in turn, must be integrated into a regional strategy to reduce environmental pollution.

a. Effect of Alternate Growth Patterns on Land Use and Vehicle Emissions in Los Angeles. The SCAG-76 forecast has projected that an additional 171,823 people will live in the Hyperion Service Area in 1990. The forecast also projected housing units, total employment, and number of acres that will become urbanized. SCAG, in conjunction with LARTS branch of Caltrans, then distributed these regional numbers to smaller Regional Statistical Areas and to the LARTS traffic analysis zones. This distribution of population, dwelling units and employment were used to estimate future vehicular travel and mobile source emissions.

Indirect adverse impacts of the proposed project have been described in Chapter IX and include projected effects related to population, housing, employment, land absorption, VMT and emissions, and other factors. These future effects discussed for 1980, 1990, and 2000 reflect land use projections based on existing public policy and the circulation network which will be presumed to exist in 1990. These impacts will be the project base case against which the potential effect of mitigation will be measured. Two basic strategies will be discussed in relation to mitigation: growth management controls over the nature, timing, and pattern of development and/or alterations of transportation and emissions for major activity centers.

b. Description of Alternative Growth Scenarios Used for Relative Air Quality Analysis. The development of air quality effects associated with mitigative measures has been performed using 10 km grid cells laid over the Los Angeles area. This gridwork of data incorporates information from 1285 Traffic Analysis Zones covering the same area and is designed to be consistent with future Air Quality Maintenance Plan studies. Figure X-4 shows the 45 analysis zones superimposed on a base map. Twelve zones have been defined as the Hyperion Service Area with five representing the San Fernando Valley and seven the Coastal Plain portions of the service area.

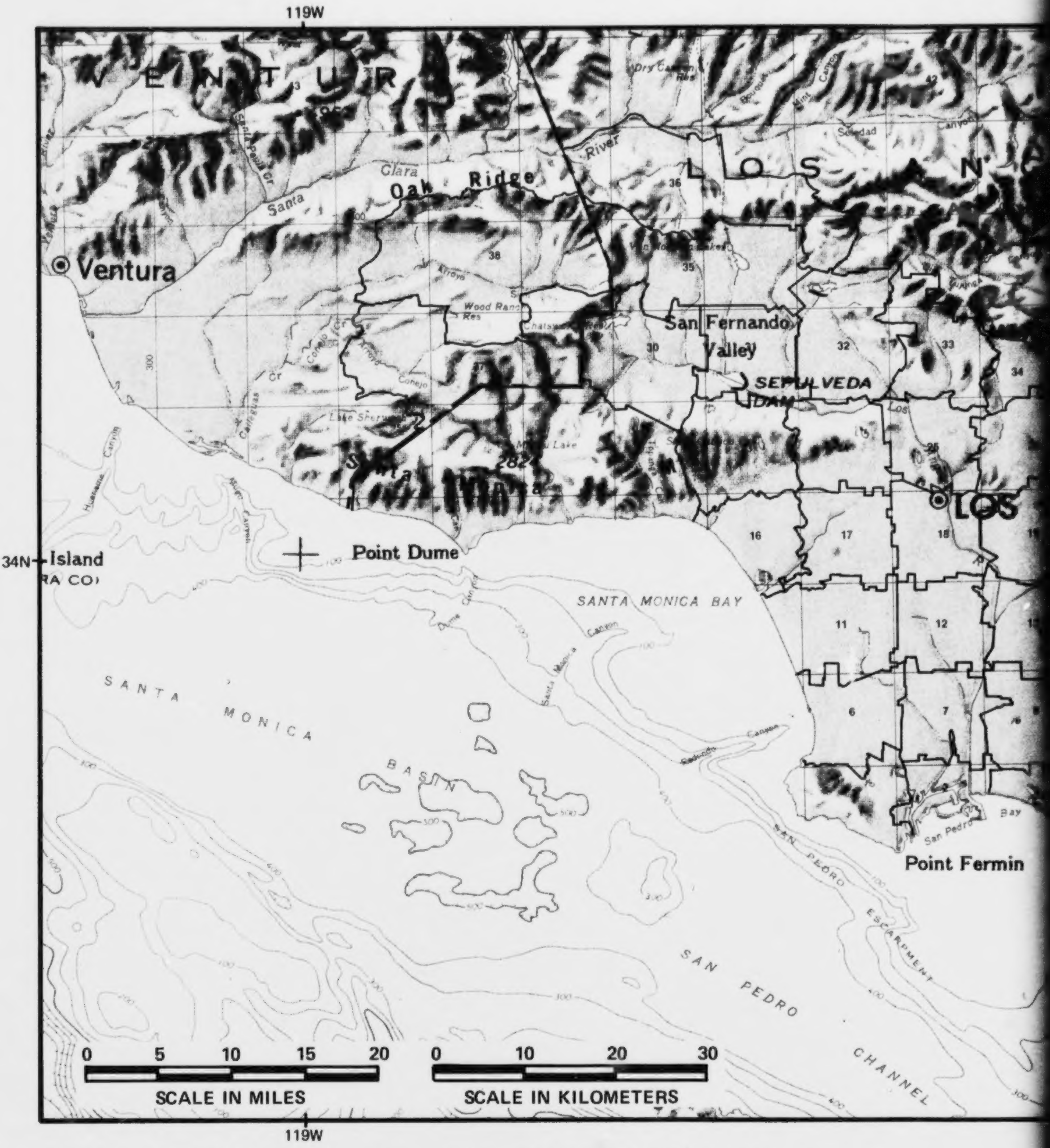
A baseline year consistent with 1974 existing conditions and a projected year, the SCAG-76 projections for 1990, were mapped to present baseline and horizon years. Alternative growth and population distribution scenarios have been developed to analyze future population, land use, VMT and air quality if future population distribution were different from that projected by SCAG-76. The relationship of these scenarios to the major EIS alternatives and the policies necessary for each scenario are presented in the scenario descriptions below. More scenarios than project alternatives are presented here in order to examine the potential mitigative effectiveness of possibilities such as clustering growth or displacing growth from one portion of the SCAB to another.

(1) NO GROWTH SCENARIOS. These alternatives indicate the 1974 levels of dwelling units and employment that were existing in 1974 and utilizes 1990 emission factors.

(a) No South Coast Air Basin Growth. This scenario identifies the maximum improved air quality possible should a state, federal, or powerful regional agency curtail all growth in the South Coast Air Basin. This is tantamount to a concerted No Project decision for all south coast wastewater treatment agencies and districts combined with an immediate moratorium on all new development within the South Coast Air Basin. Population, land use, and VMT will remain at 1974 levels and air quality improvements will result from implementing technological changes. No growth is permitted in the entire South Coast Air Basin; the projected DOF E-O growth for the Air Basin is required to locate outside the air basin and no additional urban land would be developed. This scenario is not an alternative that could be instituted by the City of Los Angeles alone and would face considerable resistance from a political aspect.

(b) No Growth in the Hyperion Service Area. Under this scenario, the Hyperion Service Area portion of growth from SCAG-76 would occur outside the defined South Coast Air Basin. This analysis assumes a regionwide Los Angeles City moratorium on construction activity in conjunction with a "No Project" decision associated with the failure to meet state and federal water quality standards. Inherent in this scenario is the assumption that regional treatment capacity would not be available to accommodate South Coast Air Basin growth through 1990 at the DOF E-O level. Population levels and geographic distribution inside the Hyperion Service Area would remain constant while some air quality changes would occur as a result of technological source changes that are already anticipated.

(c) No Growth in the San Fernando Valley. This scenario projects that the San Fernando Valley portion of the SCAG-76 projected growth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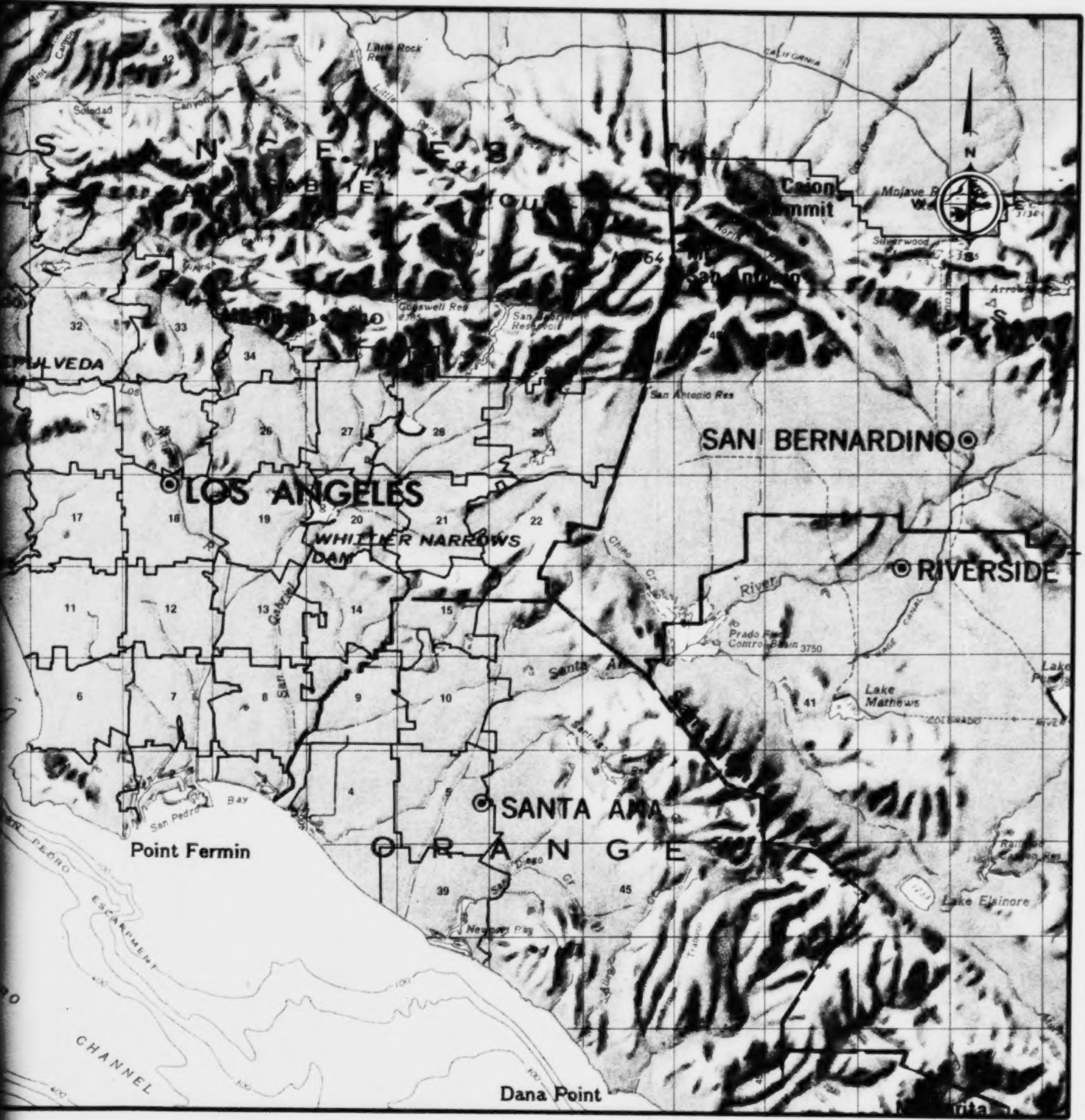
VENTURA
Ventura
Santa Clara River
Oak Ridge
LOS ANGELES
San Fernando Valley
SEPULVEDA DAM
LOS
Point Dume
34N
Island
SANTA MONICA BAY
SANTA MONICA BASIN
SAN PEDRO CHANNEL
SAN PEDRO ESCARPMENT
Point Fermin
San Pedro Bay
0 5 10 15 20
SCALE IN MILES
0 10 20 30
SCALE IN KILOMETERS
119W

Figure X-4. Traffic analysis zones superimposed on a regional base map.


LOS ANGELES
SAN BERNARDINO
RIVERSIDE
SANTA ANA
ORANGE
EPULVEDA
WHITTIER NARROWS DAM
Cajon Summit
Mojave R
Little Rock Res
Soledad
Mint Canyon
Cogswell Res
San Gabriel Reservoir
San Antonio Res
Silverwood
Chino Cr
River
Prado Flood Control Basin
3750
Lake Mathews
Lake Elsinore
Colorado River
Santa Ana R
San Diego Cr
Newport Bay
San Pedro Bay
Point Fermin
Dana Point
San Pedro Escarpment
Channel
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that the San Fernando Valley portion of the SCAG-76 projected growth will not occur within the South Coast Air Basin. This would result from a "No Project" decision, a building moratorium in the San Fernando Valley, and continued development south of the mountains despite the failure to meet water quality criteria. Growth in the portion of the service area located below the Santa Monica Mountains as well as growth in the remainder of the South Coast Air Basin would occur as projected in the SCAG-76 analysis. Under this scenario, the 1974 population of the San Fernando Valley would prevail in 1990 while the Coastal Plain would grow to the projected 1990 levels. The citywide growth rate would be lowered to a total of 3.8 percent for the period.

(2) CLUSTERED GROWTH SCENARIOS. Clustered growth scenarios concentrate new growth into areas at a higher density than forecast in SCAG-76.

(a) Valley and CBD Clusters. This scenario is consistent with the feasible Alternatives B4C, C3, and E2 of the Facilities Plan. The projected growth in the City is not permitted to be distributed as anticipated by SCAG-76 but is instead concentrated in two areas of clusters. This scenario is an attempt to project the environmental effects of a concentrated effort to institute the Centers Concept. Policy decisions required to meet this alternative include extensive downzoning of non-centers, upzoning of centers, and economic stimulation including taxation policies, that would promote intensive and discourage extensive development. This scenario would require a more rapid change in the life-styles of Los Angeles residents from the suburban single family residence with a long commute and automobile dependence to the multiple family residence "close-in" to the employment and commercial center and a greater use of alternative transportation modes.

(b) Super CBD Cluster. Should Alternative CX be instituted, it would be possible to concentrate all Hyperion Service Area growth in the Wilshire corridor. This scenario assumes increased density along the corridor combined with a moratorium on development in the San Fernando Valley, extensive downzoning in other parts of the city to prevent conversion of single family residences into multiple family units, and taxing and subsidizing policies to promote conversion of Los Angeles into a more conventional eastern city with approximate concentric rings of density spreading outward from the regional core. Concomitant life-style adjustments would be required.

(c) Super Valley Cluster. The Super Valley Cluster was developed for comparison purposes and places all future service area growth in centers in the San Fernando Valley. This would result in greater growth for the Valley than projected by SCAG-76 although the areas south of the

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mountains are held at the 1974 levels. A rapidly declining Central City and continued pressure for development in the San Fernando Valley could produce this alternative. Alternatives C3, B4C, or E2 would be required for this scenario as would mitigative policies to concentrate future development projected for the San Fernando Valley into realistic centers with emphasis upon public transportation and continuous employment-residential development.

(3) DISPLACED GROWTH. For the scenarios, new housing and employment in the service area were real to other parts of the air basin.

The scenario for displaced valley growth assumes that mitigative measures fail and Alternative CX is chosen. In this case, however, it is assumed that growth that would have occurred in the San Fernando Valley will locate by choice throughout the Basin, including in the remainder of the City of Los Angeles. The allocation of population was based upon current migration flows as reflected in driver's license reissues. An estimated 27 percent of the projected growth will locate in Los Angeles, south of the mountains and 55 percent of the projected Valley growth would relocate within the County of Los Angeles. This would place increased burdens upon neighboring wastewater treatment systems, especially the LA County SAND facilities.

(4) DISPLACED HYPERION GROWTH. This scenario assumes the "No Project" alternative combined with an immediate moratorium curtailing all new development within the entire Hyperion Service Area. In this case, however, population is permitted to locate in accordance with historical intrabasin migration patterns. An estimated 70 percent of the total projected growth for the City would remain in the County, placing heavy demands upon the LA County SAND treatment facilities and increasing County growth with concomitant impacts upon air quality.

(5) DISPLACED GROWTH AND DISPLACED VALLEY GROWTH. These assume growth as projected by SCAG-76 in the planned scenario and that same growth reallocated in the displaced scenario.

(a) Planned Growth. Current facilities planning efforts are directed toward accommodating SCAG-76 population totals and distribution. This scenario is the SCAG-76 projection with an approximate total of 7 percent growth in the service area for the planning period. Some growth will occur in all areas of the City but the West Valley will receive the greatest increase, a total of 22 percent above estimated 1974 levels.

(b) Valley Growth Displaced to the South Half of the City. This scenario is that projected under Alternative CX. The SCAG-76 growth totals are reallocated so that no growth occurs within the San Fernando Valley and all growth that would have located in the Valley is allocated within the Hyperion Service Area, south of the mountains. This scenario would involve policy decisions that include failure of the mitigation strategies for minimizing secondary air quality impacts, failure to institute the maximum reclamation alternative, construction of SCAG-76 capacity requirements at Hyperion, no Valley hydraulic relief, and an immediate moratorium on any new development in the San Fernando Valley.

c. Effects of Alternative Growth Scenarios. The main effects of these alternative growth scenarios were determined using the traffic simulation model described in Appendix II B.

(1) EFFECTS ON VMT. Table X-2 summarizes the growth scenarios and the resulting daily trips and VMT. Trips are projected to increase from 17.6 million in 1974 to 20.8 million (18 percent) in 1990 (assuming no growth in the Hyperion Service Area). Planned growth in the City will increase trips from 20.8 million to 21.5 million (3.3 percent) in 1990. Under this scenario, the increases in vehicle trip travel within the service area occurs chiefly in Orange County.

The projected trip activity for the clustered growth, planned growth and displaced growth scenarios are virtually identical. This is due to the fact that the regression equation used to generate the number of trips is a function of dwelling units and employment—parameters that are equal for each of these scenarios in numbers but not in location. The location, while not affecting the total number of trips, does influence VMT. Clustering the projected service area growth tends to reduce regional VMT—but only less than 1 percent. Dispersing the forecasted service area growth tends to increase trip length and VMT by about 1 percent.

(2) EFFECTS ON EMISSIONS. The trip and VMT data presented in Table X-2 reflect a very low level of nonautomobile transit—equivalent to the 1967 LARTS survey data. This represents the highest level of VMTs and emissions that could be anticipated for 1990. In order to define a band within which the "true" emissions level will fall, a very optimistic "high transit" scenario was analyzed to underscore the effects of cluster versus dispersed growth. This clustering would involve a concentrated effort of growth management incorporating factors identified in Table X-3 applied to differing parts of the service area. Ideally, clustering housing close to employment makes alternate modes of transportation such as walking, biking, mass or rapid transit more attractive, while dispersed housing and employment tend to reinforce the present propensity to one person per car travel. The major conceptual transit zones are shown in Figure X-5.

Table X-2. Basinwide VMTs and emissions for various growth scenarios.

YEAR	GROWTH SCENARIO	LOW TRANSIT					HIGH TRANSIT			
		TRIPS $\times 10^6$	VMT $\times 10^6$	RHC TPD	NO_x TPD	CO TPD	VMT $\times 10^6$	RHC TPD	NO_x TPD	CO TPD
1974	Present	17.6	175.2	1,106	824	8,145	—	—	—	—
1990	I - No growth (basinwide or region specific no project and building moratorium decisions):									
	No growth in SCAB	17.6	175.2	231	439	1,393	132.6	172	349	984
	No growth in Hyperion Service Area growth	20.8	211.3	281	520	1,715	161.0	210	414	1,234
	Displaced Hyperion Service Area growth	21.6	219.2	292	538	1,786	167.1	218	428	1,286
1990	II - Coastal (without Valley hydraulic relief Alternative CX):									
	No San Fernando Valley growth	21.2	213.9	284	527	1,740	163.0	213	419	1,250
	Shifted San Fernando Valley growth to South City	21.5	216.3	288	532	1,761	164.8	215	423	1,266
	Displaced San Fernando Valley growth	21.5	217.3	289	534	1,770	165.6	216	425	1,273
	Clustered growth in CBD	21.4	215.2	286	530	1,750	163.9	214	421	1,258
1990	III - Inland/Coastal, Coastal/AVORS, and maximum reclamation projects (with Valley hydraulic relief, Alternatives B4C, C3, and E2):									
	SCAG-76 Forecast	21.5	217.0	289	534	1,766	165.2	216	424	1,270
	San Fernando Valley and CBD clusters	21.4	216.2	287	531	1,758	164.5	215	422	1,264
	Clustered growth in San Fernando Valley	21.5	217.4	289	534	1,768	165.4	216	424	1,271

The high-transit scenario assumes:

- 40 percent reduction of short lengths (0-3.5 mile) surface street trips
- 20 percent reduction of medium (3.5-6.2 mile) length surface street trips
- 20 percent reduction of long (>6.2 mile) freeway trips

to be achieved by a combination of:

- Increased bicycling or walking
- Minibus service in high activity centers

Table X-3. Effect of alternative 1990 growth patterns on vehicle emissions of reactive hydrocarbons—tons/day.

GROWTH SCENARIO	LOW TRANSIT		HIGH TRANSIT	
	REGION	SERVICE* AREA	REGION	SERVICE* AREA
1. No Growth in SCAB (same as 1974)	231	68.8	172	46.0
2. No Growth in Hyperion Service Area	281	71.9	210	48.1
3. No Growth in San Fernando Valley	284	75.2	213	50.2
4. Clustered Growth				
Valley and CBD Clusters	287	77.8	215	52.0
All Valley Growth to South City	288	77.7	215	52.1
Super CBD Cluster	286	76.4	214	51.1
Super Valley Cluster	289	79.4	216	53.2
5. SCAG-76 Plan	289	78.7	216	52.5
6. Displaced Valley Growth	289	76.1	216	51.1
7. Displaced Hyperion Growth	292	73.3	219	49.4

*Sum of zones 11, 16, 17, 18, 23, 24, 25, 30, 31, 32, and 33.

- Maximum carpool and vanpool programs
- Centers area transit in major activity centers such as downtown, Century City, and the airport
- Express subscription bus service

The relative effect of the four types of growth scenarios and two transit levels on emissions of reactive hydrocarbons is given in Table X-3. Additional emissions due to growth in the service area is 8 tons per day as has been discussed earlier in the report. Clustering all of this growth downtown could save 3 tons per day regionally with the low level of transit, and dispersing the growth outside the service area will increase emissions by 3 tons per day regionally. Within the service area, clustering saves 2.3 tons per day. Dispersing growth saves 5.4 tons per day for the City by shifting the burden to other parts of the basin.

With a high-level transit, the savings in emissions due to clustering become more apparent. The combination of clustering growth and high transit more than offset the additional emissions due to growth (with a low level of transit).

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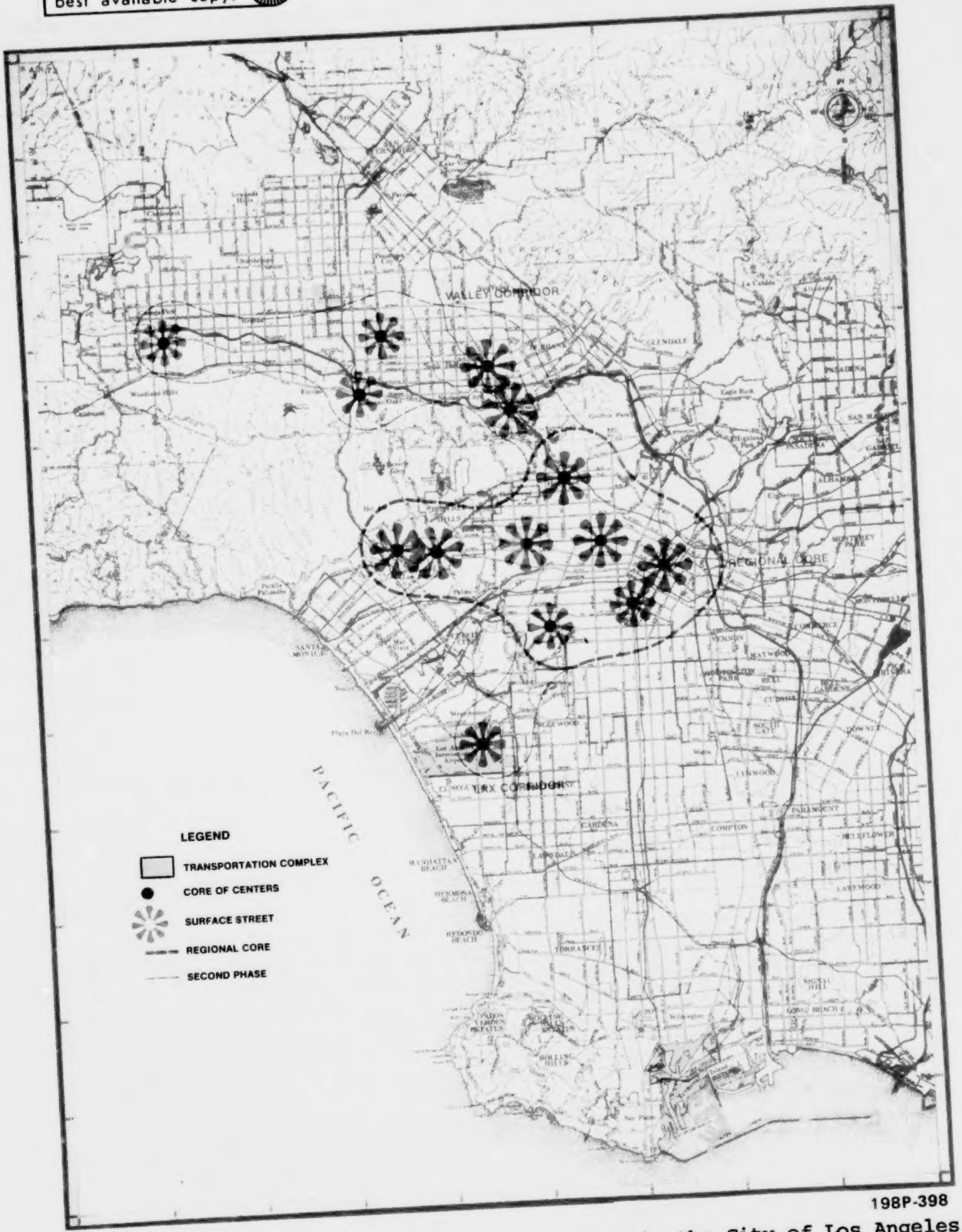
VALLEY CORRIDOR
GLENDALE
PASADENA
REGIONAL CORE
SANTA MONICA
PACIFIC OCEAN
LAX CORRIDOR
VERNON
INGLEWOOD
GARDENA
COMPTON
LYNWOOD
PARAMOUNT
BELLFLOWER
LAKEWOOD
DOWNEY
MANHATTAN BEACH
HERMOSA BEACH
REDONDO BEACH
TORRANCE
LONG BEACH
SIGNAL HILL
ROLLING HILLS
LEGEND
TRANSPORTATION COMPLEX
CORE OF CENTERS
SURFACE STREET
REGIONAL CORE
SECOND PHASE
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Figure X-5. Conceptual "high transit" zones in the City of Los Angeles.

d. Summary of Land Use Effects. The following conclusions can be stated regarding mitigative measures designed to cluster or disperse growth:

- Clustering tends to reduce trip length.
- Clustering can reduce emissions substantially only if most of the growth is concentrated in one or two locations and there is sufficient transit available to absorb personal trips.
- Clustered growth, by itself, cannot mitigate all adverse transportation impacts.
- Dispersing growth increases trip mileage.
- Dispersing growth decreases vehicle emissions in the service area but shifts the burden to the rest of the basin.
- Dispersing growth increases basinwide emissions.

e. Transportation Systems for Major Activity Centers. Transportation/land use measures to minimize air quality by reducing vehicle miles traveled (VMT) have been identified and their effectiveness, in cases, has been quantified both in terms of VMT and emission changes. Although it is beyond the scope of this EIS to do the detailed planning necessary for the immediate implementation of these transportation/land use measures, a few general problems and conclusions can be made:

- Present urban transportation tends to isolate and immobilize nondrivers: the poor, secondary workers in one-car families, the young, the old, and the handicapped.
- Public transit service too often is characterized by excessive walking distances to and from stations, poor connections and transfers, infrequent service, unreliability, slow speed and delays, crowding, noise, lack of comfort, and a lack of information for the rider's use. Moreover, the passengers are too often exposed to dangers to personal safety while awaiting service. These deficiencies lead to a loss of patronage and further decline in service for the remaining passengers.
- Congestion results in daily loss of time to the traveler. Too often "solutions" are expensive in dollars and destroy the urban environment in the process.
- Transportation functions and rights-of-way require extensive amounts of urban land (approximately 20 percent), and compete with other important uses of urban land resources. More rational urban land use patterns aided by new forms of transportation could help reduce travel demands (as can substituting communications for urban transportation) and achieve greater total transportation service for the amounts of land required.

- Air, noise, and aesthetic pollution from current modes of urban transportation in Los Angeles are high.

People assemble each day in the major activity centers of the City, including Los Angeles International Airport, shopping centers, industrial parks, universities, and especially, central business districts. Currently, much of the travel in these areas is provided by autos, taxis, and buses, operating on City streets, frequently under highly congested conditions. More than half the automobile travel in Los Angeles occurs in such areas in trips less than 3-1/2 miles. Increasing travel demands of this kind tends to encourage multiple-automobile ownership and use.

6. MOBILE EMISSION MANAGEMENT STRATEGIES

a. Circulation Element. Transportation Management Strategies are those groups of tactics designed to reduce the number of vehicle trips and emissions while maintaining a high degree of mobility. Tactics may involve incentives, such as improved transit systems or safe walking and bicycling routes or may involve disincentives such as parking surcharges or higher gasoline taxes. Several frequently discussed measures for reducing mobile source emissions are shown in Table X-4. Generally the more effective and long-lasting tactics are those that eliminate vehicle trips such as mass transit as opposed to those tactics that reduce congestion. Also, substantial reductions may be possible with low polluting fuels or new engines (turbines, turbo charged diesel, etc.).

In the Hyperion Service Area, where air pollution problems persist, mobile emissions form about 65 percent of the pollution burden to which residents are exposed. Figure X-6 summarizes the mobile emission baseline and trends for the area. This three dimensional graph identifies the contribution of each mobile source to nonmethane hydrocarbons (HC), oxides of nitrogen (NO_x) and carbon monoxide (CO). The overall pollutant load is projected to decline with light duty vehicle emissions showing the greatest improvement, but still contributing from 10 to 30 percent of the emissions by the end of the period.

The automobile is the dominant method for personal transportation in the service area, accounting for 88 percent of the total passenger miles traveled in 1975 (see Chapter II). The privately owned automobile is the most widely used mode of travel for the average Los Angeles family. It provides transportation: to and from work; for shopping and related activities; and for recreation. Private and public enterprises also make extensive use of passenger vehicles in the conduct of their business, maintaining large fleets for their operation.

Despite its disadvantages and expense, the convenience and widespread public acceptance of the automobile, together with the existence of a substantial transportation network of roads and freeways and the low-density urban sprawl strongly argue for the continuing widespread

Table X-4. Tactics for reducing mobile emissions of RHC in the service area.

TACTIC	EFFECTIVENESS			LOS ANGELES CITY COUNCIL'S POSITION		PARTICIPATING AGENCIES[1]											COST[2] EFFECTIVENESS			
	MODERATE TO SUBSTANTIAL	MINOR	POSSIBLY COUNTER PRODUCTIVE	OPPOSED	ENDORSED	LOS ANGELES & CONTRACT CITIES	LOS ANGELES COUNTY	SCAG	SCRTD	CALTRANS	AIR RESOURCES BOARD	FCC	PRIVATE SECTOR	COMMUTER COMPUTER	FEDERAL GOV	PUBLIC UTILITIES	SAVINGS	LOW	MODERATE	HIGH
Transportation Management Tactics																				
Preferential bus/carpool lanes			X		X	C		C	L	L							-	-	-	-
Ramp metering			X			C				L							-	-	-	-
Upgrade traffic controls		X				L													X	
Carpooling/vanpooling	X				X	C								L		C	+			
Public Transportation and Paratransit																				
Rail rapid transit		X				C	C	C	L	L										X
Increased bus service	X				X	C			L											X
Dial-a-ride	X								L											X
Park and ride/kiss and ride[3]		X						C	L											
Nontransportation																				
4-day work week		X				C							L							
Staggered work hours		X				C							L							
Clustered development of new growth (through zoning and taxation)		X				L	L													
Parking management		X		X		L														
Communications substitutes	X											L					+			
Gas rationing (15%)	X			X							C				L		+			
Nonmotorized Incentives																				
Bicycle paths	X					L				C							+			
Technology																				
Low polluting fuel or cleaner engines	X												L		C					X
Retrofit devices on older autos	X				X						L								X	
Vehicle inspection and maintenance	X				X		C				L							X		
Motorcycle standards		X			X						L								X	

[1] L = lead agencies, C = contributing organizations, U = unknown, NA = not applicable.

[2] Low = 0-$2,000/ton, moderate = $2,000-$10,000/ton, high > $10,000 ton.

[3] Could provide moderate effectivness if riders use transit to get to collection stations rather than personal autos.

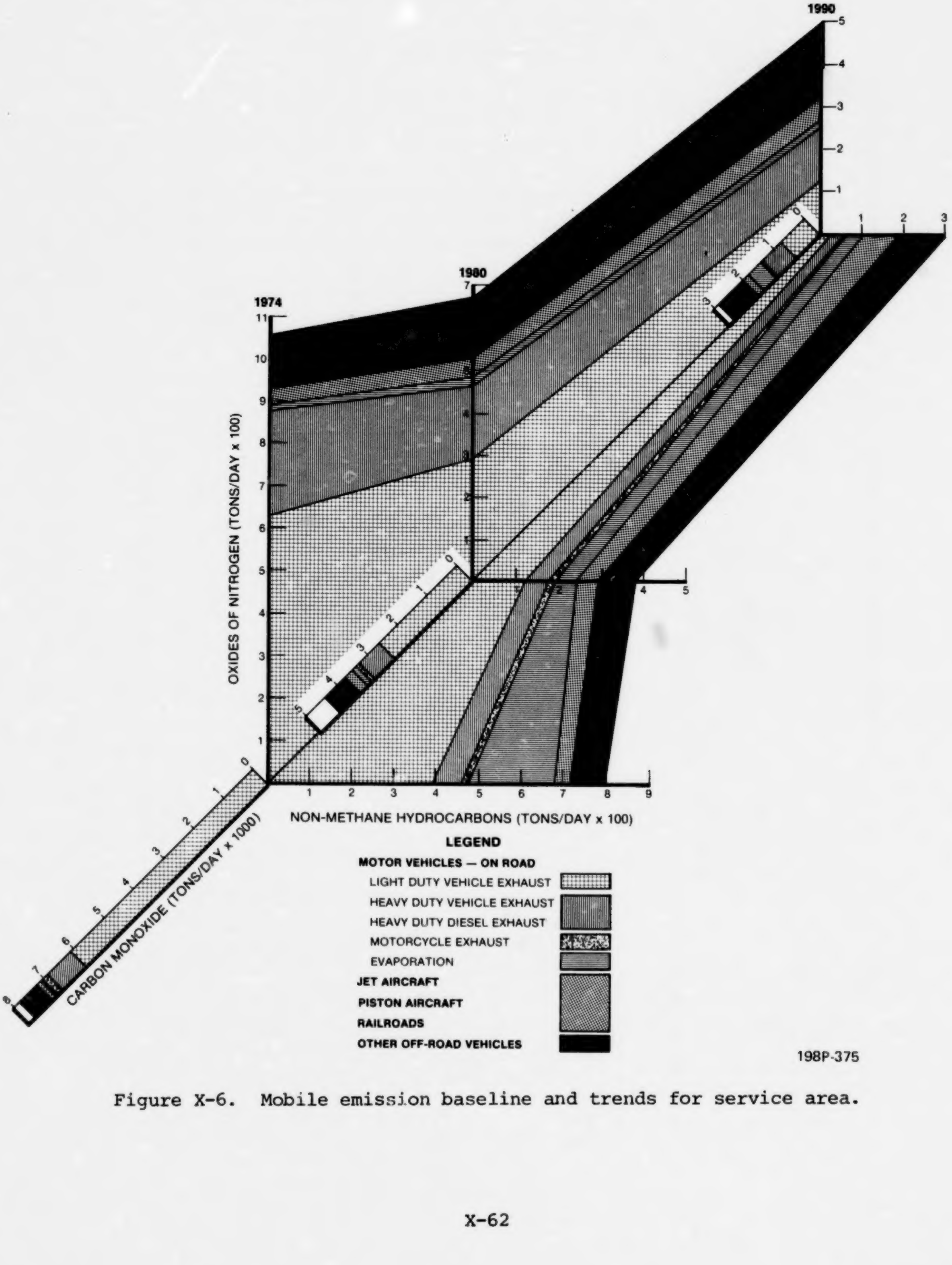


Figure X-6. Mobile emission baseline and trends for service area.

use of private automobiles in the Los Angeles area. Major mitigation measures to minimize environmental impacts in all contexts (air quality, energy consumption, etc.) are therefore important.

The Environmental Protection Agency has special responsibilities to assure that adverse impacts are eliminated or minimized to the maximum extent possible in cases where federal statutes (i.e., the Clean Air Act) would be contravened. Therefore, the purpose of this section is to suggest transportation management strategies that will mitigate adverse impacts on air quality of increased vehicular travel permitted by implementation of the Facilities Plan.

b. General Mitigation Strategy. The following are general strategies for reducing vehicular emissions:

- Special emphasis should be placed on maximizing the use of transit for nonwork trips, particularly the short, home-oriented trips. Nonwork trips constitute about 70 percent of all vehicle trips and they contribute heavily to air quality degradation due to "cold-start" and "hot-soak" engines.
- All measures which continue to reinforce the dependency on the private auto should be rejected. For example, park-and-ride lots encourage short trips to the transit stations which in turn generates trips and emissions. A better approach would be to collect commuters in small transit vehicles and then bring them to the transit station.
- Auto disincentives must be staged simultaneously with the provision of reasonable alternatives to use of the private auto.
- Improvements in transit operations which reduce total door-to-door travel time should be emphasized to encourage greater patronage. This includes greater frequency in service, better servicing of residential areas and major activity centers, better access to transit by foot or bicycle and improved coordination of service so that transfers can be made.
- Land use planning and transportation planning must complement each other with special attention to maximizing the intensity and variety of activity near transit facilities and in major activity centers.
- Institutional arrangements which promote better coordination of transit service and improved response to ridership needs are required. More intensive use should be made of already existing local transit resources such as school buses, taxis, and delivery services.

- Funding for all levels of transit should have a broader base and level of subsidization.

Table X-5 shows the daily vehicle miles traveled in the Hyperion Service Area. A large fraction of the emissions are a result of intrazonal trips or trips to neighboring zones; in other words, the shorter trips (0-6 miles). The longer trips, from the San Fernando Valley to the CBD Wilshire Corridor, represent about 10 percent of the emissions within the service area. As was discussed in Chapter II, about 55 percent of the shorter trips (0-6 miles) are either home-to-shopping or home-to-other purposes while about 40 percent of the longer trips (20+ miles) are work related.

Table X-5. Daily vehicle miles traveled (millions) in LARTS region (1974) (Ross, 1975).

SPEED	PEAK HOURS		OFFPEAK HOURS		SUB-TOTALS
	FREEWAY	CITY STREETS	FREEWAY	CITY STREETS	
15		1.026		.037	1.063
20		5.801		3.538	9.339
25	.793	16.299		4.832	21.924
30	2.538	7.369		33.226	43.133
35	4.201	2.426		7.509	14.136
40	5.423	1.328		7.624	14.375
45	2.205	.487	.220	1.473	4.385
50	5.380	.539	2.115	1.286	9.320
55	5.200	.323	5.264	1.030	11.817
60	.991	.030	37.223	.141	38.385
65	.304	.065	.817	.127	1.313
SUB-TOTALS	27.035	35.693	45.639	60.823	169.190

Figure X-7 shows the relative effect of diverting light-duty vehicle trips to other modes of transportation. Since walking or bicycling produces no emissions, they are the most effective modes for reducing emissions. However, diesel buses, assuming a large occupancy, can reduce emissions substantially, even with an average loading factor of 0.40. Dial-a-Bus does not appear to be very effective if heavy-duty gasoline engines are used. If diesel engines are used, then emissions reductions similar to the larger buses can be expected.

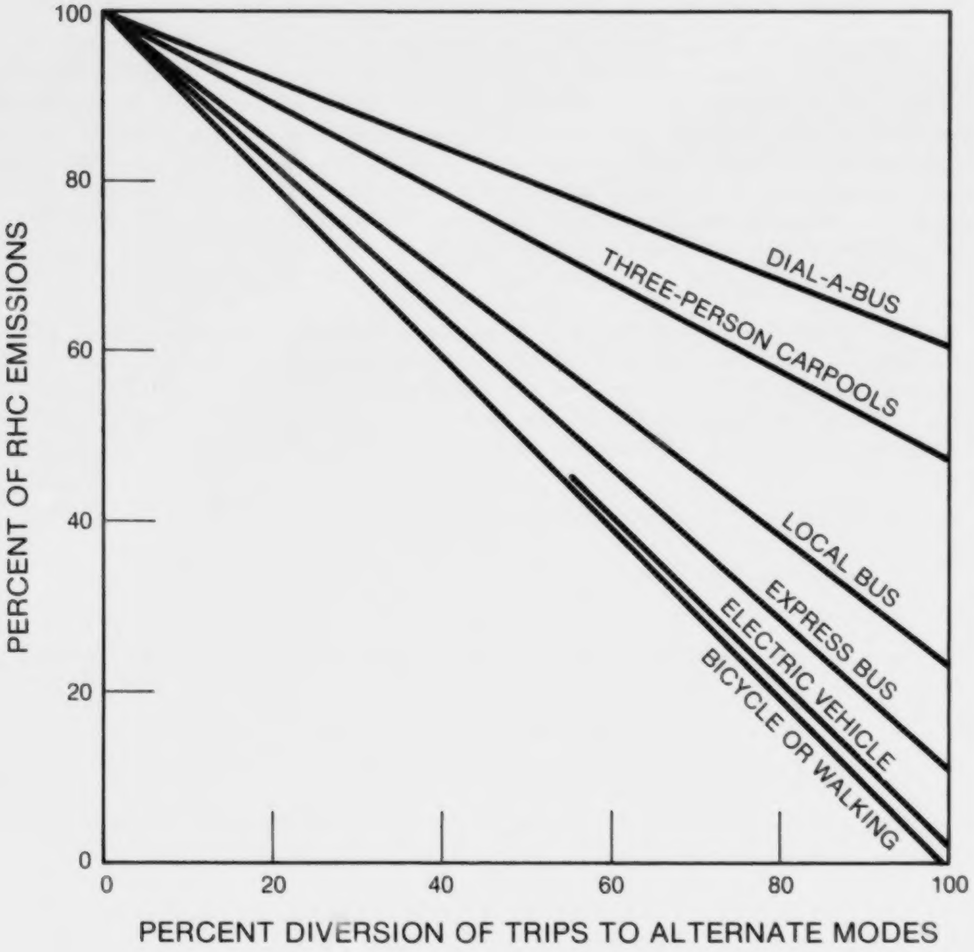
c. Near-Term Strategies. The EPA's transportation control plan for the Los Angeles Air Quality Control Region specified several tactics to be implemented by 1977 to achieve the oxidant health standard. The Los Angeles City Council endorsed several of these measures but objected to the parking management, parking surcharges and gas rationing tactics as they were written.

EPA measures include the following:

- Bus/carpool lanes
- Review of parking facilities
- Require employers to discourage commuting by single-passenger autos
- Establish a regional carpooling system
- Gas limitation as needed (post 1977)

Additional recommendations designed to either complement or supplement the EPA strategies include:

- Implementation of extensive technological emission controls for both stationary and mobile sources will result in substantial improvements to air quality by 1977. However, the National Air Quality Standard for oxidant may never be achieved in the Los Angeles Air Quality Control Region under the presently conceived technological emission control strategy (i.e., the oxidant standard may be violated on many days each year).
- Several transportation management alternatives are available which could yield meaningful reductions in VMT (without recourse to economic disincentives) and could also significantly alleviate losses in personal mobility (as measured by trips foregone) caused by increasing gasoline prices.
- The reductions in VMT that could be achieved through transportation management strategies would yield savings in total petroleum consumption and—over the next several years—would cause some further improvements in air quality. However, beyond about 1985 and assuming implementation of full



ASSUMPTIONS: EMISSION CHARACTERISTICS OF VARIOUS VEHICLE TYPES

MODE	HYDROCARBON EMISSIONS (grams/mile)	OCCUPANCY
Express Bus (diesel)	2.25	20.0
Local Bus (diesel)	4.6	20.0
Dial-a-Bus (heavy duty gasoline powered)	6.1	10.0
Jitney (late model LDV)	0.8	–
Average Auto (carpool)	1.4	3.0
Average Auto	1.4	1.4
Electric Vehicle	0.03	2.0

Source: U.S. Environmental Protection Agency, "Supplement No. 5 for Compilation of Air Pollutant Emission Factors," Second Edition, March 1975.

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Figure X-7. Effectiveness of diverting light-duty vehicle trips.

technological controls, a reduction in VMT would cause only a very modest improvement in air quality because the emissions from light-duty motor vehicles will then represent only about one-third of the total emissions of reactive hydrocarbon in the region.

- Future mass transit systems designed for implementation in the long term (1990) cannot be justified on the basis of anticipated improvements in air quality because reductions in VMT over the long term will have only a small effect on regional air pollution (RAND, 1976).

d. Long-Term Measures. Attainment of the health standards for oxidant will require the application of numerous emission reducing tactics, both to mobile and stationary sources. Emission control devices now required on new cars are expected to reduce vehicle emissions 76 percent in the service area from 1978 levels. However, emissions from mobile sources alone will cause the health standard for oxidant to be exceeded in 1990. Long-term measures to reduce emissions such as rail rapid transit, advanced clean engines, clean burning fuels, more stringent emission standards for heavy-duty vehicles, and motorcycles may be necessary before the health standard can hope to be attained.

(1) AUTOMOBILE. Two power plant concepts potentially applicable to automobiles that currently exist in at least experimental prototype hardware and may offer the possibility of being economically mass-produced in the 1980s are:

- The Otto-cycle spark-ignition intermittent combustion engine (UC Otto). These engines burn a uniform mixture of air and fuel, usually provided by a carburetor, and have exhaust converters (catalytic or thermal) to reduce pollutant emissions. Most are of reciprocating or piston type, although some rotary (Wankel) designs are in production. Our baseline engine has a "three-way" catalytic converter system to meet the present statutory emission standards.
- Gas turbine (Brayton). The Brayton (single shaft) engine is in the form which is presently used on large commercial electric cars. Brayton (free-turbine engines) have already been employed in some racing cars and experimental automobiles. This type of engine has been in existence for many years, but only recent technical developments have made them potentially suitable for passenger car application.

Since air quality is predominantly an urban problem, vehicle emissions over the urban driving cycle are of most significance. Emission projections in HC, CO, and NO_x were made for mature-engined vehicles, based upon actual test data approximately scaled (Stephenson, 1975). The emission estimates presented in Figure X-8 are more uncertain (especially the absolute levels) than the projected fuel economies. Nevertheless, since the base-point data were either for current or experimental vehicles actually driven over the urban federal driving cycle, the estimates presented are reasonably valid approximations. The continuous-combustion power plant gas turbine is capable of emissions well below the statutory standards and would relegate the automobile to a secondary place in the list of major polluters.

The intermittent-combustion power plant can probably be "squeezed" to meet current statutory standards. It will be difficult, however, for larger cars using these power plants to be certified to the 0.4 g/mi NO_x standard and the 0.41 g/mi HC standard at the same time. This observation derives from the fact that large fractions of exhaust gas recirculation (EGR) and/or lean burning may be required to adequately suppress NO_x formation, and this will tend to increase HC formation, possibly beyond the conversion capabilities of the oxidation converter. Computational accuracy is estimated at about ±4 percent (Stephenson, 1975).

In addition, sulfate emissions (as H_2SO_4) have recently been recognized as a possible environmental problem particular to cars fitted with oxidation catalysts. The severity of the problem is currently under study by the EPA and other organizations. Preliminary data show that power systems using three-way catalysts produce less sulfate effluent than those fitted with separate oxidation catalysts. Desulfurization of fuels is one approach to solving this problem.

(2) HEAVY-DUTY VEHICLES. Heavy-duty trucks powered by turbine engines have been successfully tested under a program conducted by the Ford Motor Company between 1970 and 1973. Although technology development problems caused the project to be dropped, the acceptance of the engines as a new source of motive power was quite evident among truckers who had a chance to use it. Further development of a heavy-duty turbine engine in parallel with the introduction of an automobile turbine would seem to be a realistic course to follow. Reduction in heavy-duty-vehicle emissions would materially benefit the central urban areas now plagued with the worst air quality problems.

(3) LOW POLLUTING FUELS AND ENERGY SYSTEMS. The present energy shortage has placed greater emphasis on clean low sulfur fuels to meet environmental considerations. Candidate fuels include low thermal capacity gas (methane from sludge), synthetic natural gas and alcohol (methanol). These fuels are seen as a supplementer replacement for the natural gas and distillate oil which are currently burned in smaller stationary boilers and furnaces. One clean fuel which can be readily transported from its generator site to the user is methanol.

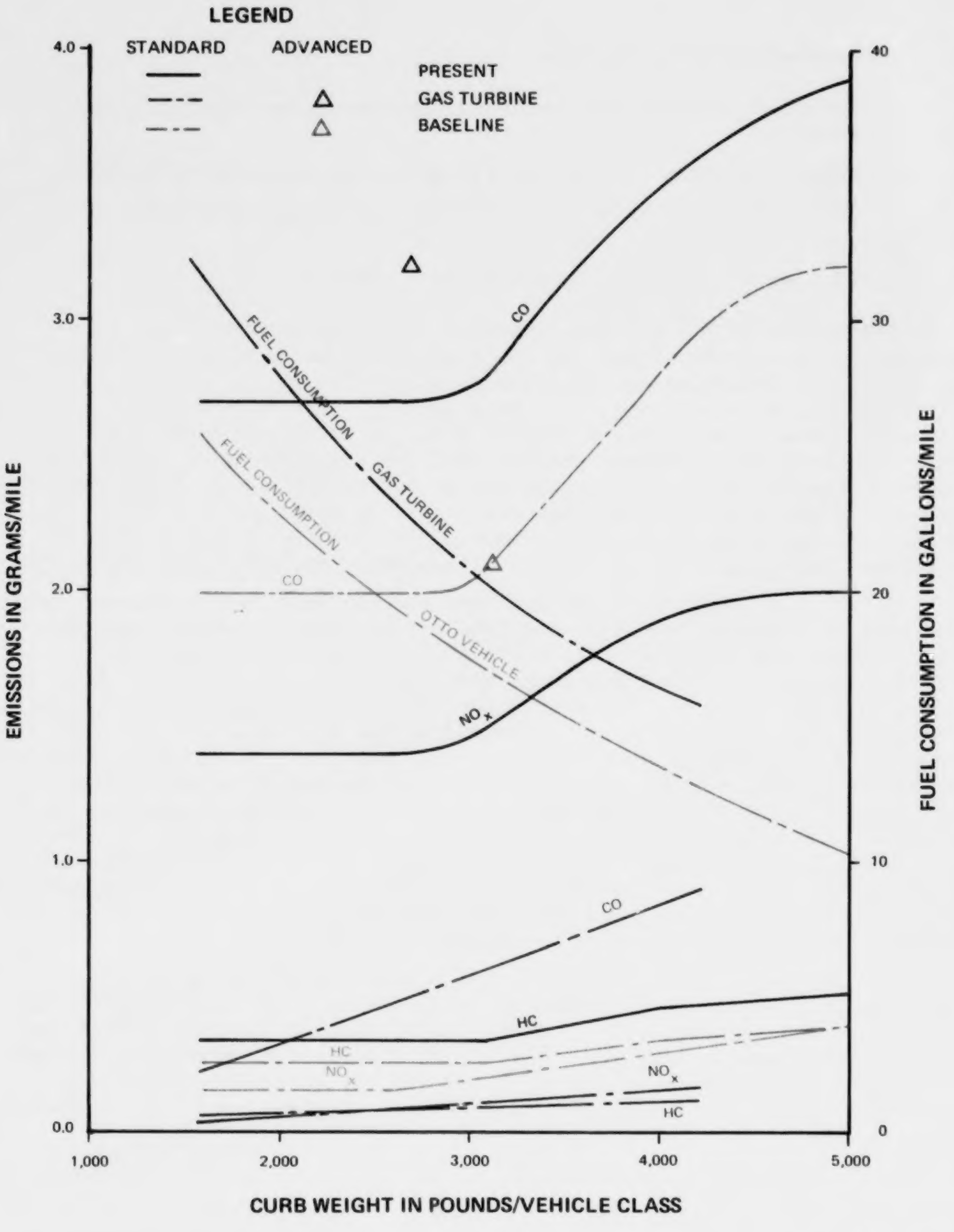

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Figure X-8. Emission estimates for power plant alternatives.

Sources of methanol include:

- Methanol produced from synthetic gas generated from coal gasification
- Production from foreign natural gas as an alternative to LNG
- Production from Alaskan North Slope gas as an alternative to compressed natural gas
- Biological synthesis from municipal wastes

Evaluation of NO_x emission characteristics of alcohol fuels in a package boiler simulator and two field operating boilers was conducted by the EPA to determine the relative potential for use by electrical utilities (G. B. Martin and M. P. Heap, 1975). The package boiler simulator results are given in Figure X-9. It should be noted that at a condition of 50 percent primary air, the nitrogen oxide levels are reduced from 85 ppm for distillate oil to 50 ppm for methanol. A comparison of the heating properties are listed in Table X-6. A 1974 study for ERDA predicted a price range of $1.41 to $3.06 per million BTU depending on process selection, siting fuel type and financing method.

A number of studies of methanol and ethanol have been conducted in the last 50 years to test their suitability as gasoline substitutes in the internal combustion engine. Existing engines can be converted to use pure methanol by decreasing the ratio of air to fuel consumed from about 14 for gasoline to 6 for methanol, by recycling more heat from the exhaust to the carburetor, and by providing for cold starts. The conversion is estimated to cost about $100 per vehicle. A municipal vehicle converted in this way has been operating satisfactorily in Santa Clara, California, since 1972. Compared with gasoline, the use of methanol in a standard test engine (without catalytic treatment of exhausts) yielded one twentieth of the amount of RHC, one tenth of the amount of carbon dioxide, and about the same amounts of oxides of nitrogen (NO_x) as gasoline. The cost of the methanol fuel would be approximately 30 percent more than present regular gasoline cost per gallon.

The ability to bring a demonstration plant on stream to produce approximately 35,000 gpd of methanol by the end of 1980 would require the joint planning and cooperation of EPA, ERDA, and the state to define the permits and licenses necessary. This fuel alternative could be evaluated in terms of cost and emissions at one of the DWP existing electrical generator units, the Scattergood Plant, which supplies power to the regional cores of the City of Los Angeles.

(4) CENTERS AREA TRANSIT. To provide accessibility and service to the profusion of origins and destinations in the Los Angeles metropolitan area, a system is needed which can be designed to be more responsive to the requirements of varying population densities and land use patterns. One

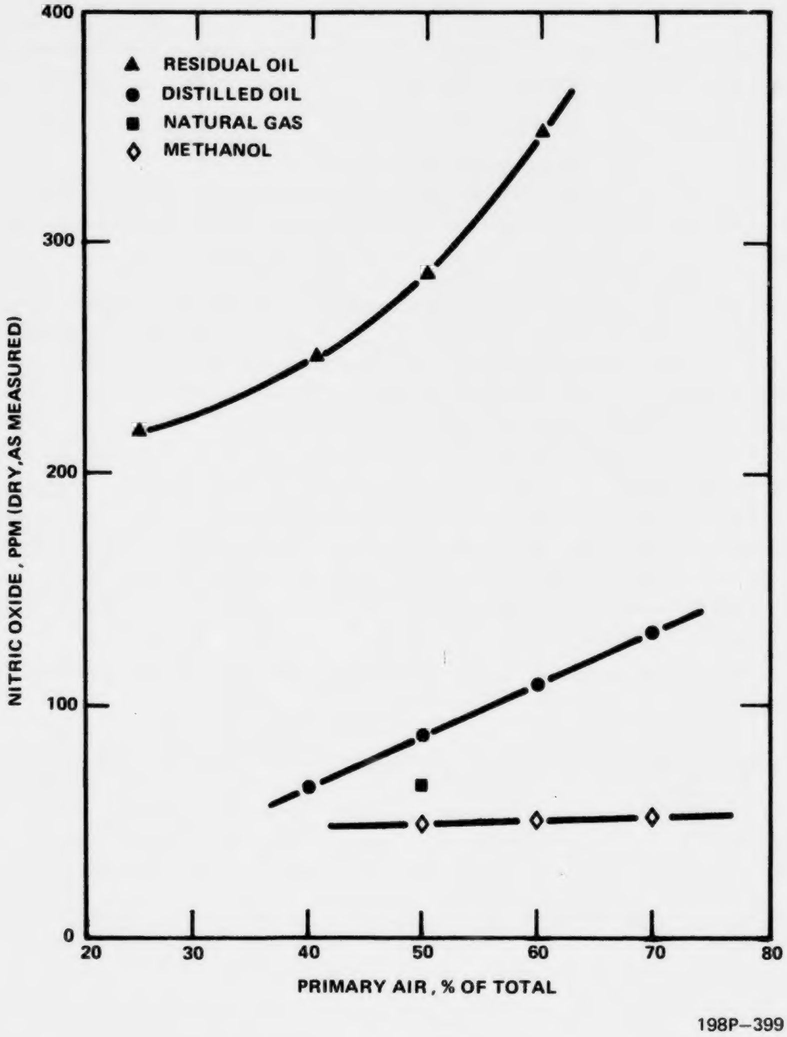

Figure X-9. Comparison of baseline nitric oxide emissions for various fuels as a function of burner primary air.

Source: G. B. Martin and M. P. Heap, 1975.

Table X-6. Comparison of fuel properties.

FUEL	COMPOSITION	HIGH HEATING VALUE X 10^7 JOULE/KG
Distillate Fuel Oil	Nominal $CH_{1.8}$	4.58
Methanol	100 percent CH_3OH	2.27
Methyl Fuel	90 percent CH_3OH 10 percent higher alcohols	2.38

long-term concept is "Centers Area Transit," sometimes called areawide individual transit or network transit. It would consist of small vehicles, each carrying about the same number of persons as an automobile. These vehicles would travel over an exclusive surface street right-of-way or guideway network, either over standard routes, or else automatically routed individually from origin to destination at network stations.

Centers Area Transit (CAT) would provide travelers the important advantages of minimum waiting time at the origin station, and private, secure accommodations. At the heart of the concept is the premise that individual transit would serve the centers in the regional core except perhaps for its lowest density outskirts, with a modular transit network, each perhaps 1 or 2 miles apart.

Such an ultimate system would have the following key performance characteristics.

- An exclusive right-of-way or one-way surface street is essential if public transportation is to be automated and if it is to escape the congestion of general street traffic. Forced to compete with automobiles on crowded streets, other forms of mass transportation are inherently at a speed disadvantage.
- Automation can make transit service more competitive with the automobile, since it is the only safe and efficient way to operate a system using numerous small vehicles.
- Small, individualized vehicles avoid the chief delays of present rapid transit: stops at intermediate stations for other passengers and waiting or dependence on a schedule at the origin station.
- In addition, use of small lightweight vehicles, with the quiet suspension and propulsion mechanisms would allow for less massive elevated guideways and station structures and thus would minimize the aesthetical impact of the system on the environment.

e. Results of Mitigation Strategies Application. Figure X-10 presents the projected mobile source emissions for the Hyperion Service Area and the emissions due to growth in the service area. The effectiveness of several measures to reduce mobile source emissions is presented for three time frames (near-, mid-, and long-terms). The decreasing return from mitigative tactics results in smaller emissions reduction in the long term compared to the near term.

Figure X-10 suggests a very aggressive control program consisting of:

- Massive bus system (quadrupling the number of buses)
- Extensive carpooling (40 percent of work force)
- High gasoline price (85 cents per gallon)

Such a program could reduce:

- Surface street travel by 40 percent
- Freeway travel by 20 percent

In summary, this section has presented several tactics for reducing reactive hydrocarbon emissions from vehicular travel and estimated the mitigation potential for each. The selection of tactics, the degree of application, and the timing for implementation are beyond the control of the City of Los Angeles. The tactics presented require basinwide application and, therefore, may involve the air quality maintenance teams, EPA, and the ARB's support for implementation.

f. Cost-Effectiveness. Figure X-11 illustrates fixed source tactics, vehicle retrofit tactics and transportation management tactics. Three very important conclusions can be drawn from this figure:

- Fixed-source controls are generally at least an order of magnitude more cost-effective than LDMV retrofit-inspection/maintenance controls.
- Similarly, retrofit-inspection/maintenance controls are about an order of magnitude more cost-effective than most transportation management controls.
- Future mass transit system alternatives should not be judged on their ability to improve air quality, but rather in terms of the necessary resource allocations and the transportation service provided to the people of the Los Angeles region.

Mitigation actions will be ineffective unless they are integrated. Single-purpose mitigation actions, applied individually without relation to other actions, will be inadequate to deal with multifaceted and interrelated problems. To obtain the desired effect of reducing air pollution

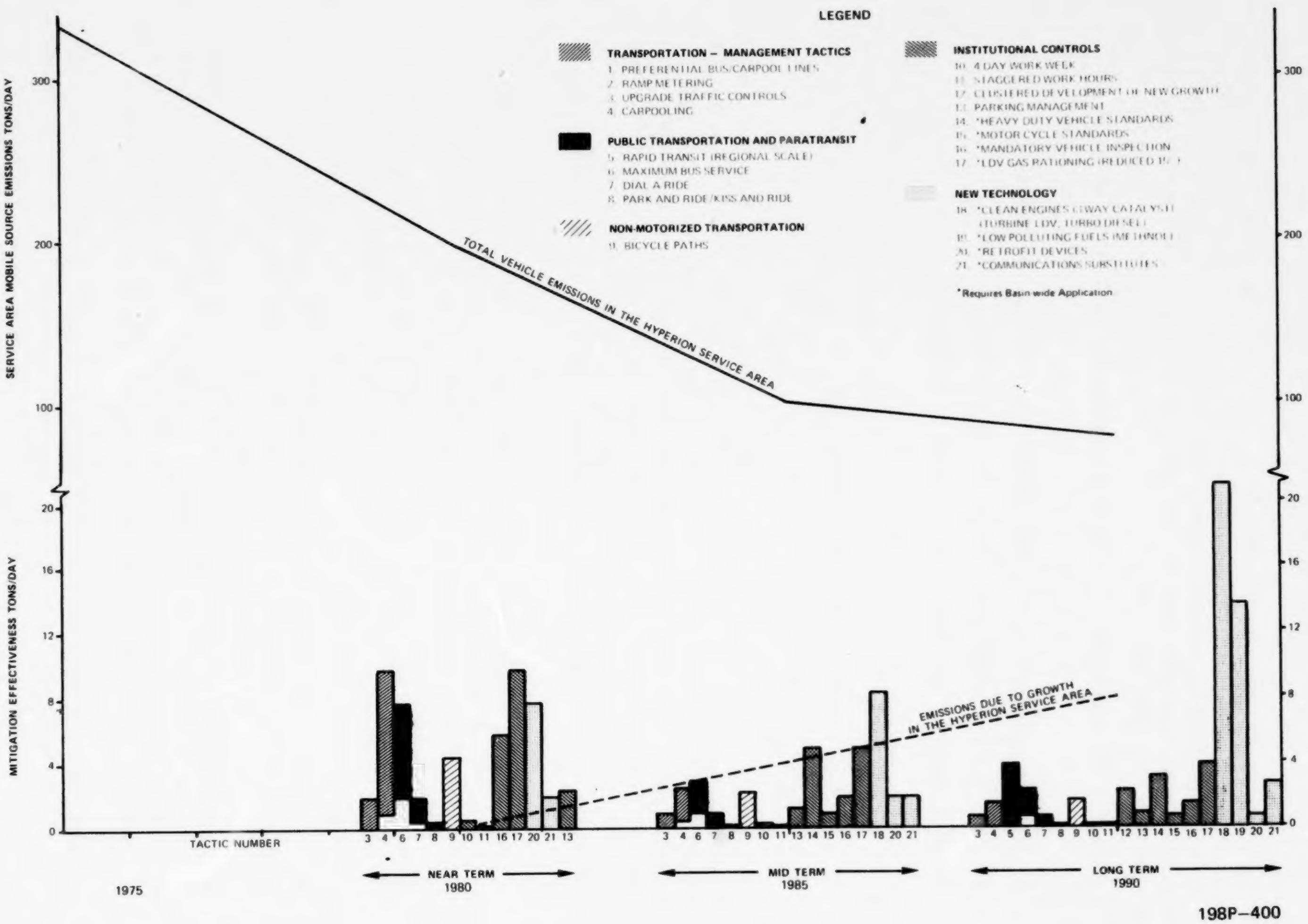

Figure X-10. Mobile emission mitigation effectiveness.

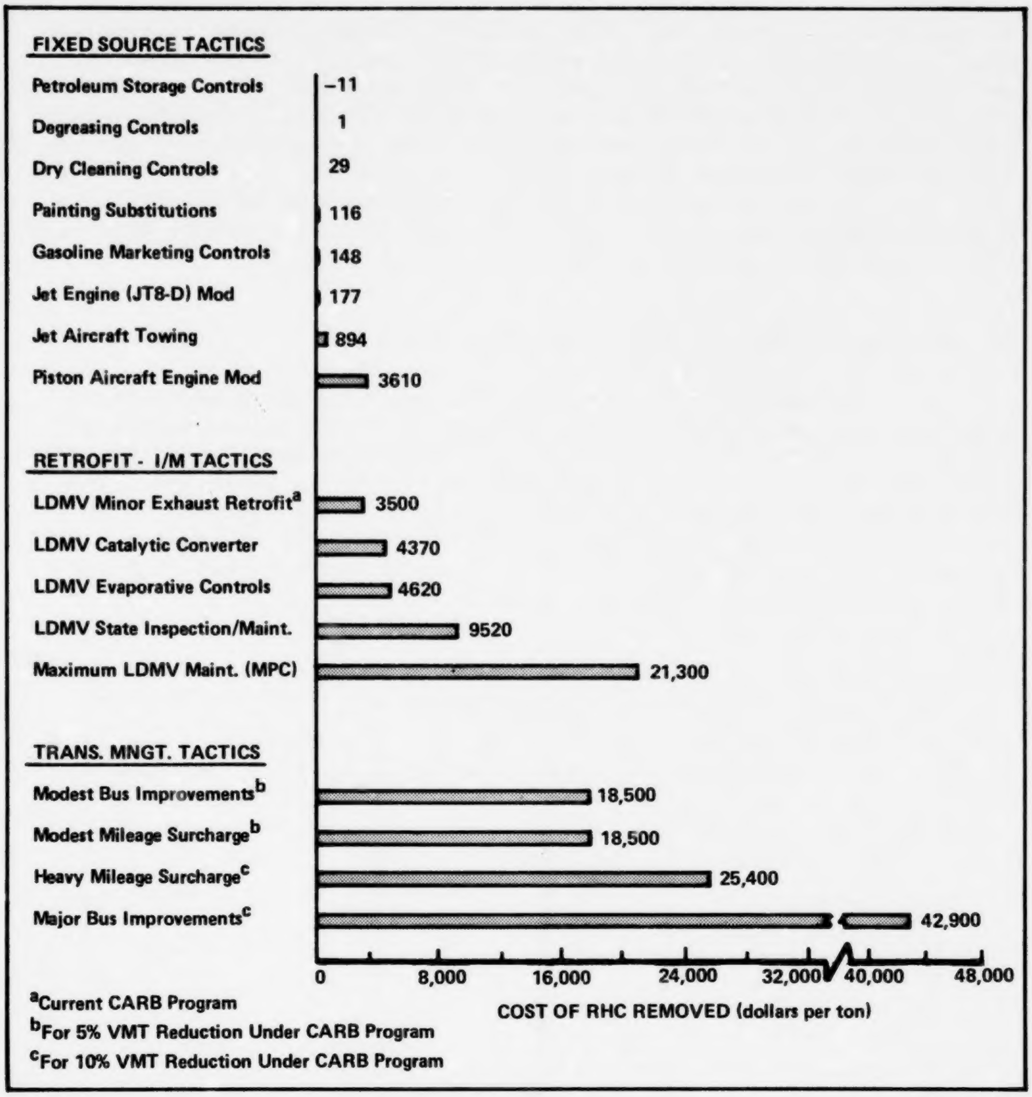

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Figure X-11. The approximate cost-effectiveness, in 1977, of tactics available for reducing RCH emissions as determined in the San Diego Clean Air Project. The first item reflects a cost savings. (Costs-benefits were calculated only in relation to air quality.)

Source: Rand, 1936.

in the South Coast Air Basin, for example, transportation strategies must be integrated with growth management strategies. Patterns of development which reduce the need for auto travel or which are suitable for future installation of alternative modes of transportation must be approached from the local, regional and state perspectives to create conditions under which development shifts could occur. The urgent need, therefore, is the establishment of intergovernmental and interagency procedures which enable the planning, coordination, funding, operating and overseeing of actions to mitigate adverse impacts.

7. STATIONARY EMISSION MANAGEMENT STRATEGIES

a. Introduction. Photochemical oxidants result when reactive hydrocarbons and nitrogen oxides combine in the presence of sunlight. The five major sources of reactive hydrocarbon emissions and the redistribution of relative source intensity are given in Table X-7. The relative decrease in mobile source emissions from 55 percent to 40 percent and the projected dramatic increase in organic solids emissions highlight the need to focus mitigation efforts on those areas of higher returns for the resource commitments required.

Table X-7. Hydrocarbon emission sources, percent.

CATEGORY	1974 RELATIVE EMISSION CONTRIBUTION	PROJECTED 1990 RELATIVE EMISSION CONTRIBUTION
Organic Solids	26	44
Petroleum Refining and Marketing	13	7
Light-Duty Vehicles	41	24
Heavy-Duty Vehicles	14	16
Other Categories	6	10

b. Stationary Emission Sources. The following stationary emission sources contribute to air quality degradation.

(1) ARCHITECTURAL AND INDUSTRIAL SURFACE COATINGS. Oil-base paints, primers, and thinners contribute substantial amounts of hydro-

carbons that could be dramatically reduced through the mandatory use of water-base and high solids paints. This mitigative measure could reduce RHC by 39 tons per day within the Hyperion Service Area. Such a requirement would be beyond APCD rule 66 and would be consistent with the current industrial trend toward water-base paints.

It is estimated that the cost per ton of RHC emissions reduced through surface coating would be in the 0 to $2,000 range in 1977 dollars.

(2) ORGANIC SOLVENTS AND SURFACE COATING. Less polluting solvent cleaning processes or containment of vapors could result in a reduction within the Hyperion Service Area of 5 tons per day of RHC emissions from such industries as dry-cleaning establishments. The small neighborhood user would be restricted to nonreactive solvents such as water, acetone, or benzene. Larger facilities could use steam cleaning and/or add carbon cannister or catalysts to existing equipment. This requirement would be consistent with APCD rules 61 and 66. The time to implement such policies is estimated at 2 to 5 years with an estimated $30 to $100 cost (1977 dollars) per ton of RHC emissions eliminated.

(3) PETROLEUM REFINING AND MARKETING. The majority of emissions from gasoline storage and handling facilities can be contained through gasoline volatility and vapor recovery equipment. Present APCD rules 61 and 63 specify 90 percent recovery efficiency. Implementation of these rules with the Hyperion Service Area would reduce RHC emissions from 2 to 7 tons per day. The cost effectiveness of vapor recovery equipment is in the $400 to $1,500 per ton range and gasoline volatility reduction could be achieved for an estimated $800 to $4,600 per ton in 1977 dollars.

C. evaluation of mitigation strategies

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C. EVALUATION OF MITIGATION STRATEGIES

The effects of 1990 emissions control strategies for the SCAG-76 population projection in general has been discussed in Chapter IX. This section presents the results of reducing emissions through growth control and emission control strategies. Emission reduction results are shown on maps of the South Coast Air Basin as changes in the isopleth shape and coverage for specified oxidant levels. The quantities of RHC specified are those projected for a typically smoggy day and are relative measures for comparison of the effectiveness of alternative management scenarios. A regional index was introduced to show the relationship between the number of days on which standards are exceeded and a representative number of people exposed to undesirable oxidant levels in the service area. The orientation of these options or emissions control cases is toward implementation on a practical basis. First, general effectiveness will be developed in terms of quantitative results. The means by which some of the required changes could be introduced and the cost to do this will then be described.

In view of the fact that presently programmed emissions controls will not reduce the air pollution load by 1990 to the NAAQS of 8 pphm in the South Coast Air Basin, any potential growth-accommodating project will at least need to be combined with mitigative measures to reduce the impacts to the no-growth level. Several cases were evaluated to determine effectiveness of mitigation strategies that might accompany or become part of the Los Angeles wastewater facilities plan. These cases will be discussed and compared using the exposure index introduced in Chapter IX.

1. NO SERVICE AREA GROWTH

No population growth inside the service area and SCAG-76 policy growth outside of it would result from a localized "no project" and immediate moratorium decision. It is highly unlikely that the projected service area growth would locate beyond the SCAB; but tight regional growth controls could produce this result. The percent reductions for stationary source NO_x emissions and reactive hydrocarbons are 14 percent and 12 percent respectively of the baseline service area emissions. Only small percentage changes in mobile emissions would occur under this population scenario so no changes were made in this input to the model. The resulting oxidant distribution pattern is presented in Figure X-12.

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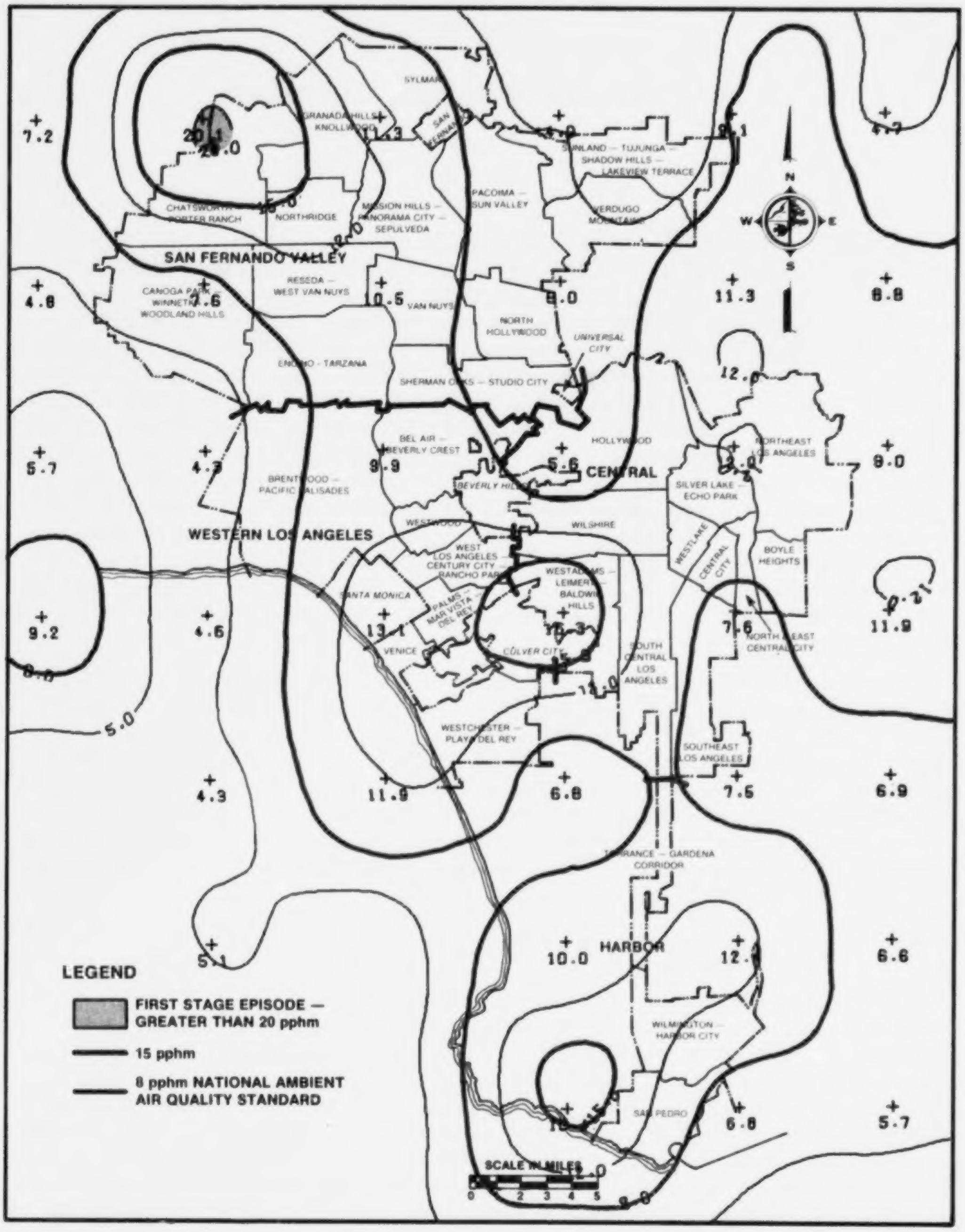

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GRANADA HILLS
KNOLLWOOD
11.3
SYLMAR
SAN FERNANDO
SUNLAND — TUJUNGA —
SHADOW HILLS —
LAKEVIEW TERRACE
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CHATSWORTH —
PORTER RANCH
15.0
NORTHRIDGE
MISSION HILLS —
PANORAMA CITY —
SEPULVEDA
PACOIMA —
SUN VALLEY
VERDUGO
MOUNTAINS
SAN FERNANDO VALLEY
4.8
CANOGA PARK —
WINNETKA —
WOODLAND HILLS
7.6
RESEDA —
WEST VAN NUYS
10.5
VAN NUYS
NORTH
HOLLYWOOD
8.0
11.3
8.8
UNIVERSAL
CITY
ENCINO - TARZANA
SHERMAN OAKS — STUDIO CITY
12.0
BEL AIR —
BEVERLY CREST
5.7
4.3
9.9
HOLLYWOOD
5.6
CENTRAL
NORTHEAST
LOS ANGELES
12.0
9.0
BRENTWOOD —
PACIFIC PALISADES
BEVERLY HILLS
SILVER LAKE —
ECHO PARK
WESTWOOD
WILSHIRE
WESTERN LOS ANGELES
WEST
LOS ANGELES —
CENTURY CITY —
RANCHO PARK
WESTADAMS —
LEIMERT —
BALDWIN
HILLS
WESTLAKE
CENTRAL
CITY
BOYLE
HEIGHTS
12.0
SANTA MONICA
PALMS —
MAR VISTA —
DEL REY
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13.1
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7.6
NORTH EAST
CENTRAL CITY
11.9
VENICE
CULVER CITY
SOUTH
CENTRAL
LOS
ANGELES
8.0
12.0
5.0
WESTCHESTER —
PLAYA DEL REY
SOUTHEAST
LOS ANGELES
4.3
11.9
6.8
7.5
6.9
TORRANCE — GARDENA
CORRIDOR
5.1
10.0
HARBOR
12.0
6.6
LEGEND
FIRST STAGE EPISODE —
GREATER THAN 20 pphm
15 pphm
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198P-402

Figure X-12. 1990 oxidant levels for no population growth within the service area.

The levels drop by 1 to 2 pphm within the service area and very little elsewhere. The location of maximum values parallels the baseline case for 1990 with some slight decrease in the extent of the areas affected. The exposure index value for this case is reduced by 27 percent from the baseline value.

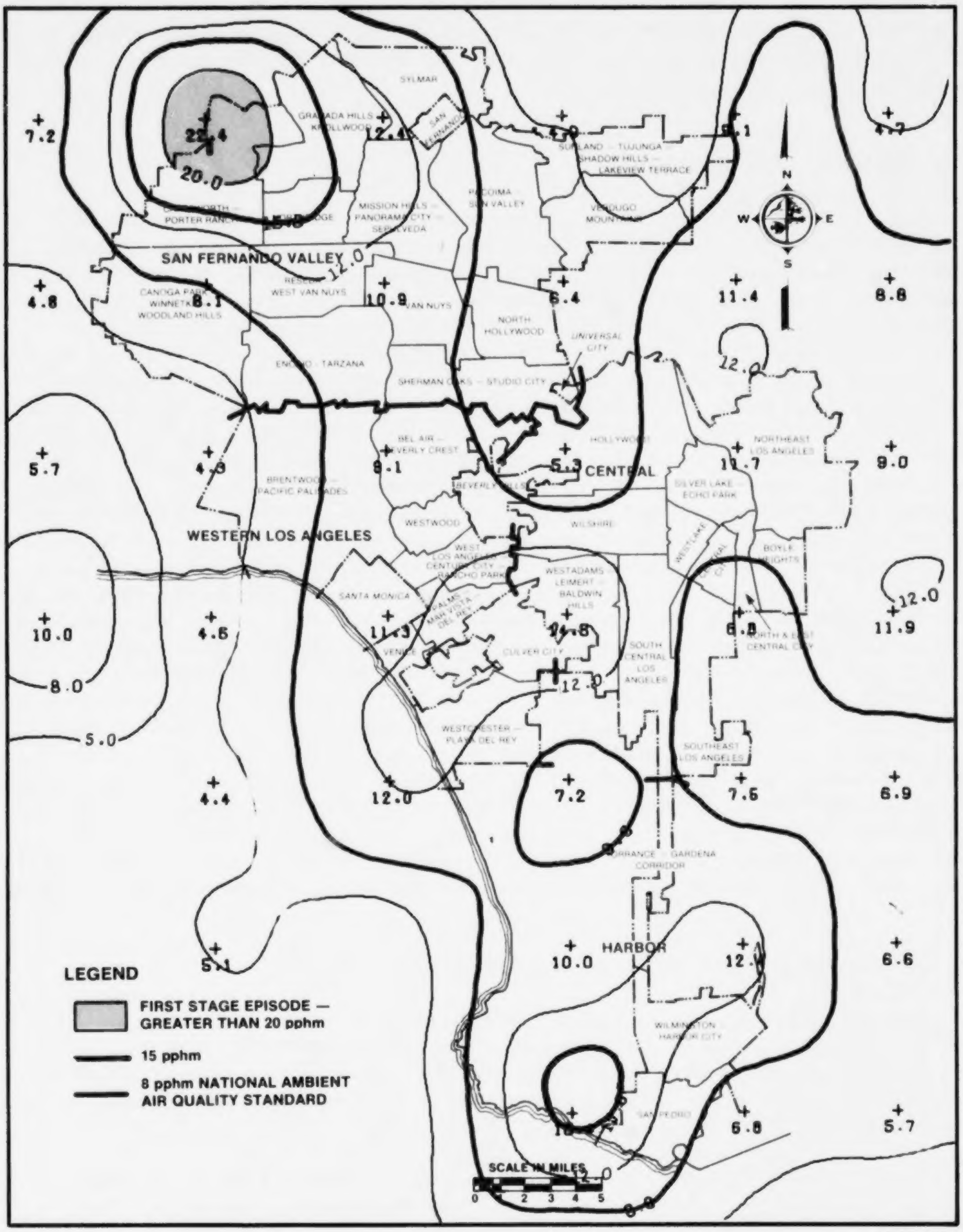
2. REGIONAL CORE MITIGATIONS

In keeping with the idea that a regional core can be defined for Los Angeles, our first case examines six 10-km squares that encompass the area along and on either side of Wilshire Boulevard, the downtown municipal area, the central Los Angeles industrial area, Culver City, Hollywood, Bel Air, Sherman Oaks, Studio City, Northeast Los Angeles, Silver Lake and Boyle Heights. This conglomerate regional core is projected to emit about 50 percent of the stationary source emissions of the service area and about 63 percent of its mobile source emissions in 1990. Control of the emissions within this 600 square kilometer region would be desirable from both the standpoint of local air quality improvement and the possibility of improvement in peripheral areas. According to the California Air Resources Board, the emissions that are projected to be the largest portion of the 1990 spectrum are those due to surface street traffic and a general stationary category identified as surface coating. These were reduced to 60 percent of their projected 1990 values for the six regional core grid squares and entered into the air quality model along with the unmodified projected emissions for the rest of the model area. The results are given in Figure X-13. Compared to the 1990 baseline, there is about 4 pphm less oxidant projected in the downtown area, about 3.5 pphm less in the Wilshire-Beverly Hills area and about a 1 pphm improvement in Pasadena. Elsewhere there is little detectable change in projected oxidant air quality. Although small, the change in pollutant level is significant within the service area because of the relatively large population to which the level change is applicable. The regional index for this case is 40 percent less than the baseline index for 1990, which indicates a considerable improvement in air quality.

3. LONG-TERM SERVICE AREA MITIGATION MEASURES

To approximate what might be a supreme effort to reduce emissions within the service area and provide a realistic upper limit of effort to achieve improved air quality within the long term, a set of strategies was hypothesized which would be enacted in addition to the present control program. These strategies consist of:

- 40 percent reduction in reactive hydrocarbon emissions from stationary sources within the regional core area in downtown Los Angeles.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198P-405

Figure X-13. 1990 oxidant levels for regional core emissions reduced 40 percent (stationary source RHC plus vehicle RHC and NO_x).

- 20 percent reduction in freeway vehicle miles through and within the service area.
- 100 percent changeover in automobile motive power to a gas turbine engine across the entire air basin.

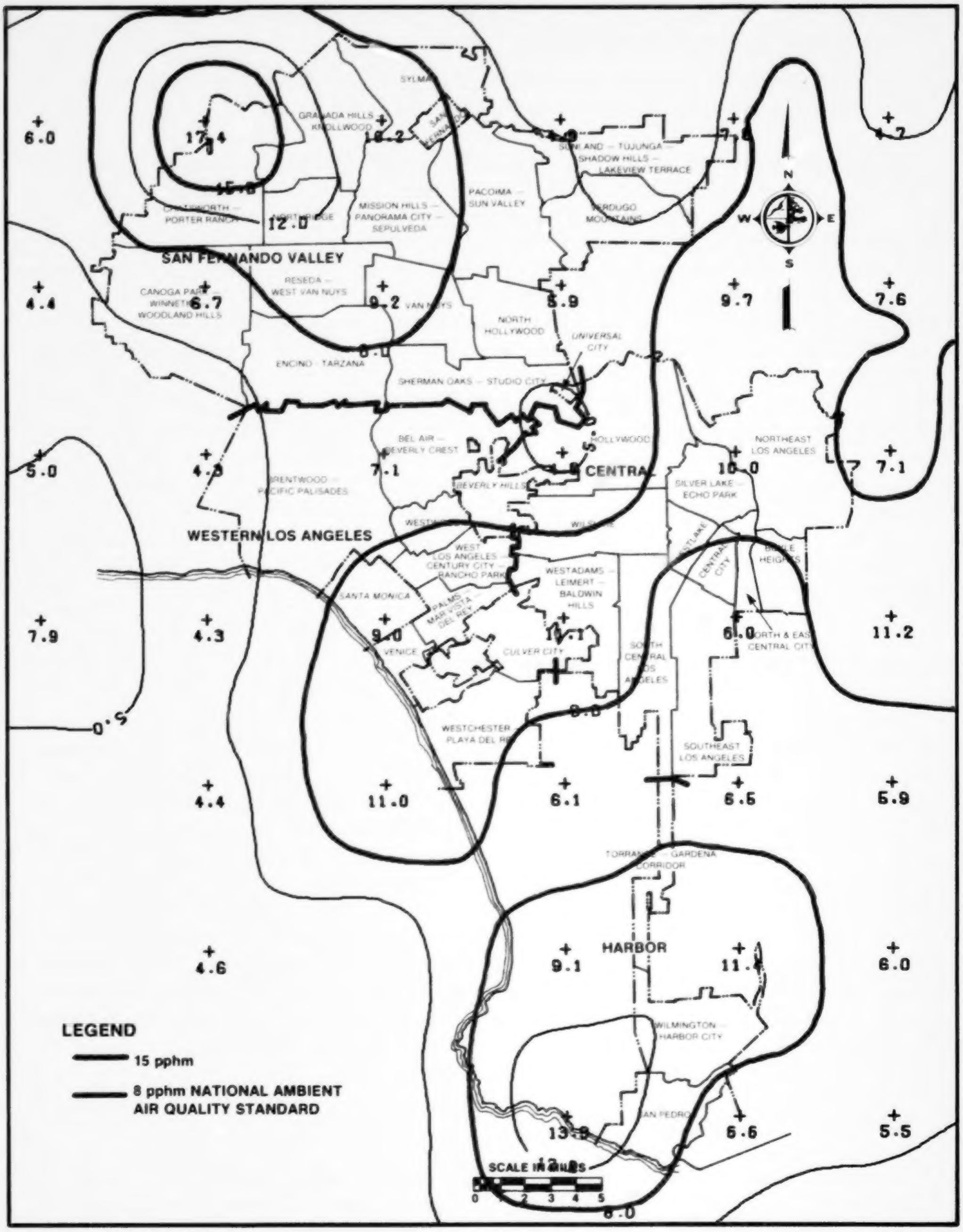
Although this appears to require a severe cutback in activity, it is not at all close to the 90 to 95 percent control strategy effectiveness advocated as necessary in some quarters. As an upper limit, the percentage reductions we have identified are more practically attainable, although reducing surface street traffic by 40 percent may not be possible without major changes in life-style. The results of this scenario are shown in Figure X-14. As would be expected, changes in oxidant level occur throughout the service area ranging from about 7 pphm (39 percent) in Central Los Angeles to 5 pphm (23 percent) in the Granada Hills area on the northern edge of the San Fernando Valley. The emissions reduction from the use of automobile turbine engines improves air quality about 20 to 30 percent so it is apparent that the oxidant changes outside of the central core are due primarily to this source change. The index value for the service area in this case is reduced about 70 percent from the currently projected value for 1990. It is also interesting to note that this massive expenditure of effort would still have over 50 percent of the source area exceeding the NAAQS on a typically smoggy day.

4. SAN FERNANDO VALLEY MITIGATION MEASURES

A reduction of 40 percent in surface traffic emissions was imposed on just the San Fernando Valley portion of the service area. No reduction in stationary source emissions was included since the Valley area is projected to account for only 30 percent of these emissions within the service area in 1990. The results of this scenario are given in Figure X-15. The only detectable changes occur in the Valley itself and even there, the magnitude is small, being only 1 to 2 pphm or less than 10 percent of the baseline projections. The index value for this case is reduced only 15 percent from the 1990 projection, making it definitely one of the less effective scenarios. This result strongly argues that mitigation measures designed chiefly to reduce automobile transportation in the Valley through growth controls or other measures will have very little effect on air quality in the service area.

5. CENTRAL CITY CONTROL MEASURES

Limited emission controls in downtown Los Angeles were designed to determine the effect of limited emissions control efforts. The reductions were limited to seven planning areas within central Los Angeles; Westlake, Central City, North and East Central City, Boyle Heights, South Central Los Angeles and Southeast Los Angeles. The population of this part of the City is projected to be 422,000 people in 1990. Imposition of travel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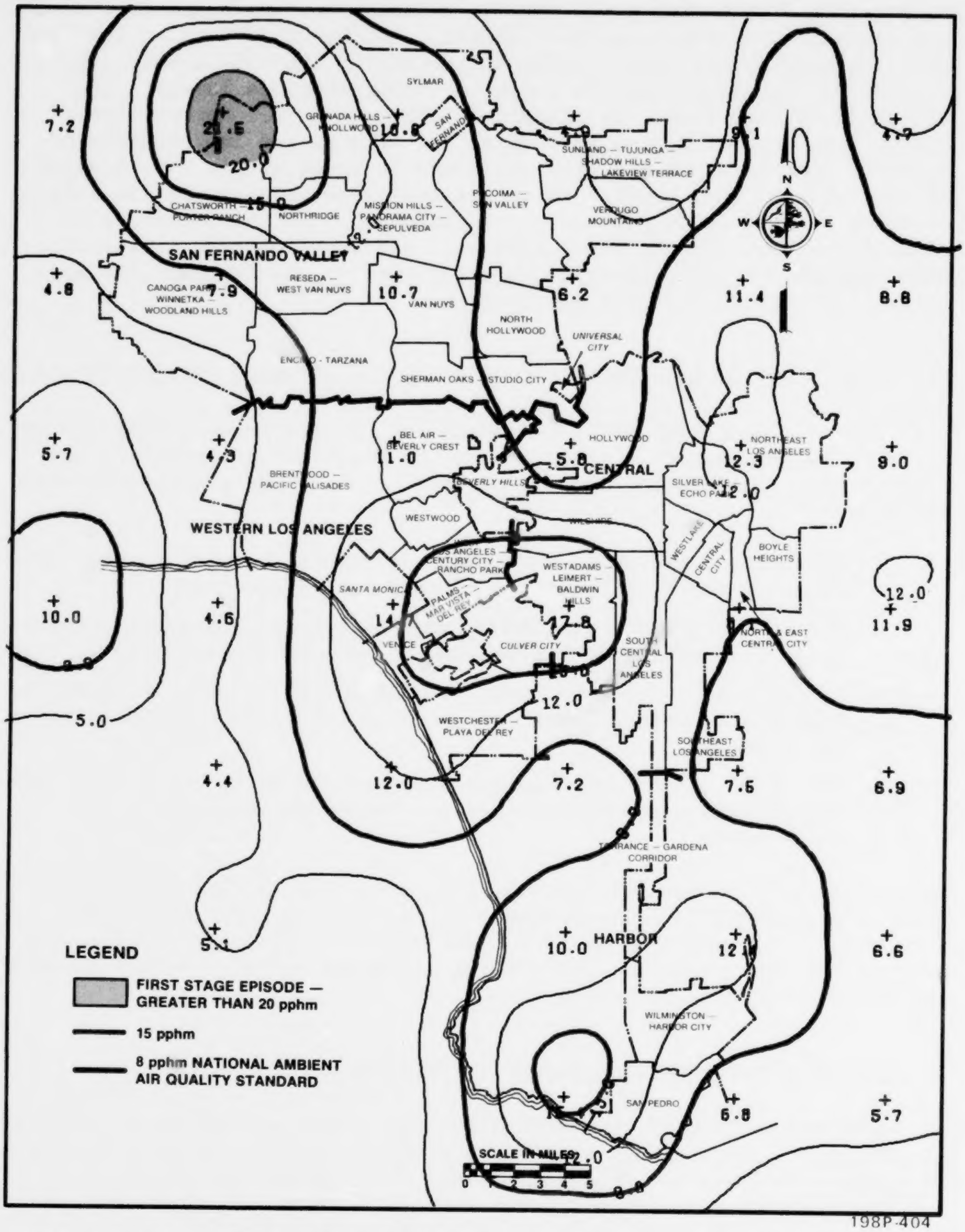
198P-403

Figure X-14. 1990—Case II. Mitigation with resulting oxidant isopleth map. Mitigation: 40 percent reduction in stationary source RHC; 20 percent reduction in freeway VMT in service area; 40 percent reduction in surface VMT in service area; gas turbine engine 100 percent.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▨ FIRST STAGE EPISODE — GREATER THAN 20 pphm
15 pphm
8 pphm NATIONAL AMBIENT AIR QUALITY STANDARD

198P-404

Figure X-15. 1990 oxidant levels for 40 percent reduction in surface traffic emissions in the San Fernando Valley.

limits and control of stationary emissions to a fairly high level might be possible within this small portion of the City. This scenario assumes the capability to reduce surface street trips by 40 percent in 1990 and reactive hydrocarbon emissions by 40 percent of the 1974 levels (about 23 tons per day less than the projected 1990 emissions level). The effect on oxidant levels is presented in Figure X-16. Approximately 3 pphm less oxidant occurs in central Los Angeles and improvements of from 0.5 pphm to about 1.0 pphm are found in areas within 6 to 8 miles of the Central City. Again, these are not large changes but the index value is reduced by 20 percent which indicates that the potential for significant improvements does exist with a focused program designed to make residential and employment opportunities in the Central City more attractive through improved air quality.

6. CURTAILMENT OF GAS SUPPLIES COMBINED WITH BASINWIDE MITIGATIVE MEASURES

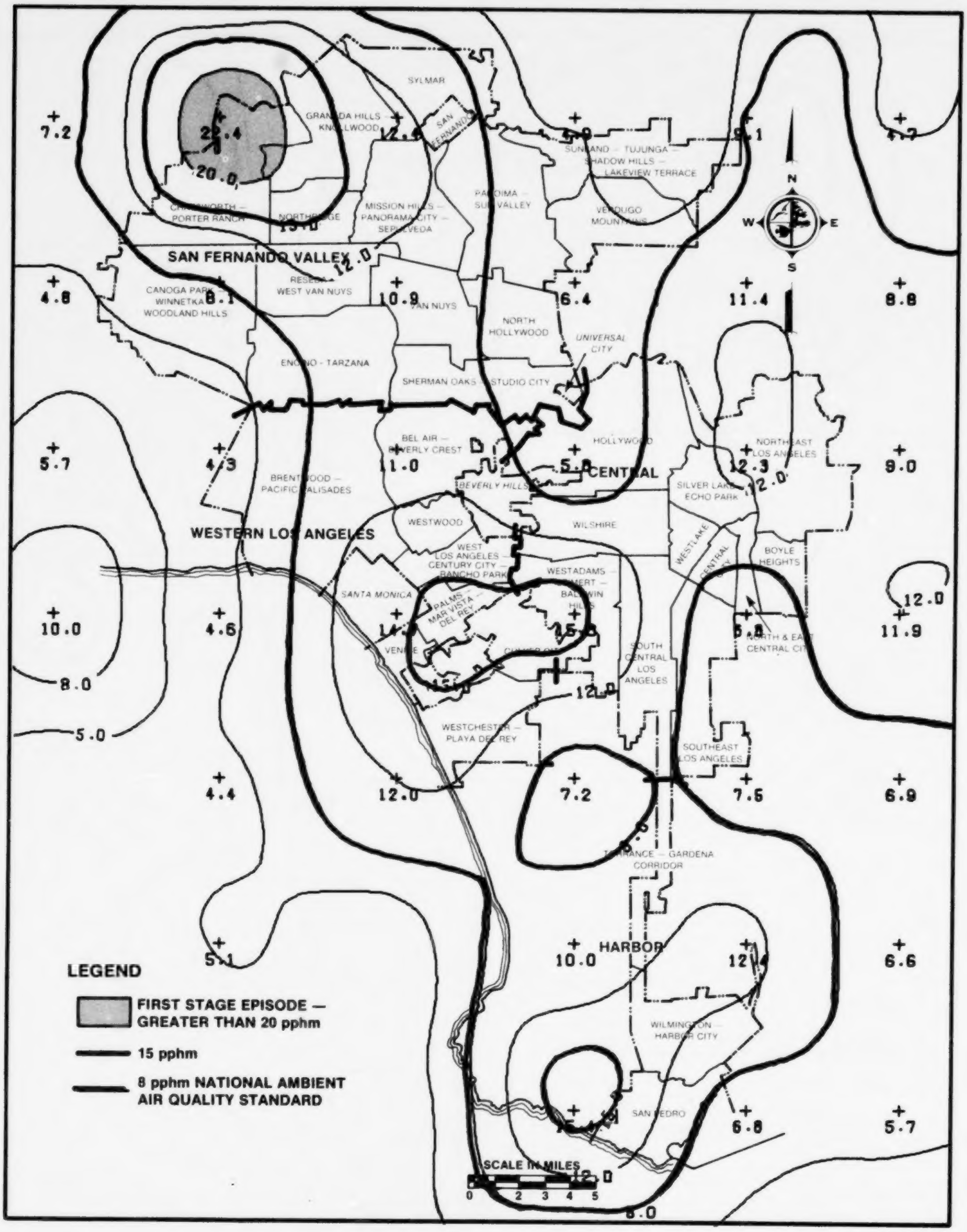
If the possibility of increased use of oil for power plants and by industry is considered, a situation can be examined that provides some insight into counterbalancing an increase in NO_x. The assumptions used here were:

- Basinwide increase in NO_x emissions from stationary sources of 40 percent over presently projected levels for 1990.
- Controls to reduce stationary source reactive hydrocarbon emissions by 40 percent in central Los Angeles and in the vicinity of Burbank.
- Controls to reduce stationary source RHC by 20 percent along the Wilshire to Santa Monica corridor, in Hollywood and in Northeast Los Angeles.
- Reduction of NO_x and reactive hydrocarbons by 20 percent for all vehicles in the Wilshire corridor, downtown Los Angeles and Culver City.

This would be a complex scenario to implement, but the end result is about a 20 percent index improvement in air quality over the present 1990 outlook, even with a large percentage substitution of oil for natural gas throughout the South Coast Air Basin. The resultant oxidant pattern is presented in Figure X-17.

7. BASINWIDE RHC REDUCTION MITIGATIVE MEASURES

The possibility of controlling oxidant levels within the South Coast Air Basin by reducing only reactive hydrocarbon emissions was examined in this case. Hydrocarbon emissions levels were reduced 30 percent from the 1990 projected baseline through regionwide adoption of mitigative measures. The total reduction of 30 percent overall could result in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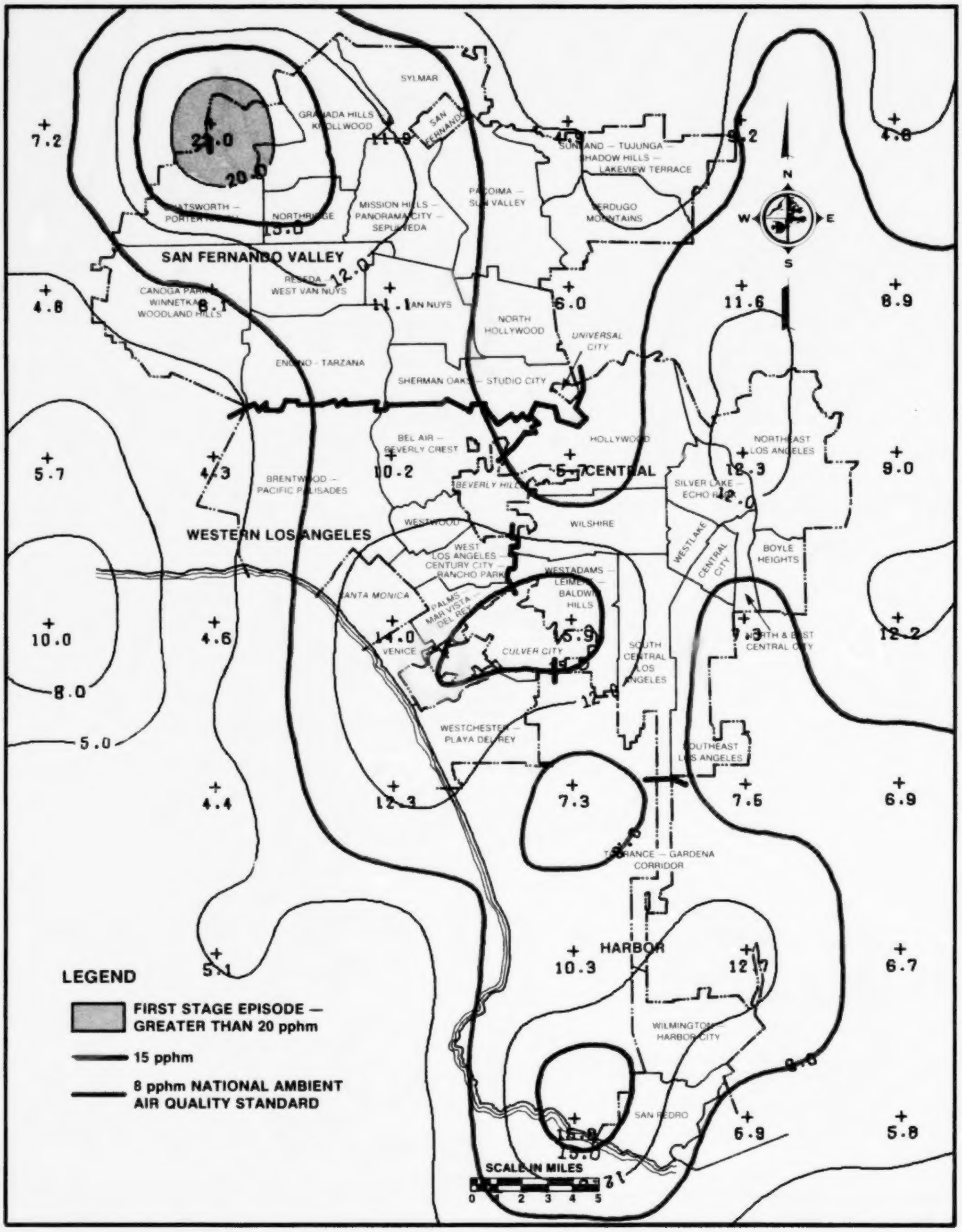
15 pphm
8 pphm NATIONAL AMBIENT AIR QUALITY STANDARD

198P-370

Figure X-16. 1990 oxidant levels for central Los Angeles mitigation. Forty percent reduction in surface street trips and 40 percent reduction in stationary source RHC from the Central City zone.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▨ FIRST STAGE EPISODE — GREATER THAN 20 pphm
15 pphm
8 pphm NATIONAL AMBIENT AIR QUALITY STANDARD

198P-424

Figure X-17. 1990 oxidant levels for 40 percent increase in stationary source NO_x in 1990; 40 percent decrease in stationary source RHC in central districts and 20 percent along the Wilshire corridor; 20 percent reduction in vehicle emissions along Wilshire in Culver City and central Los Angeles.

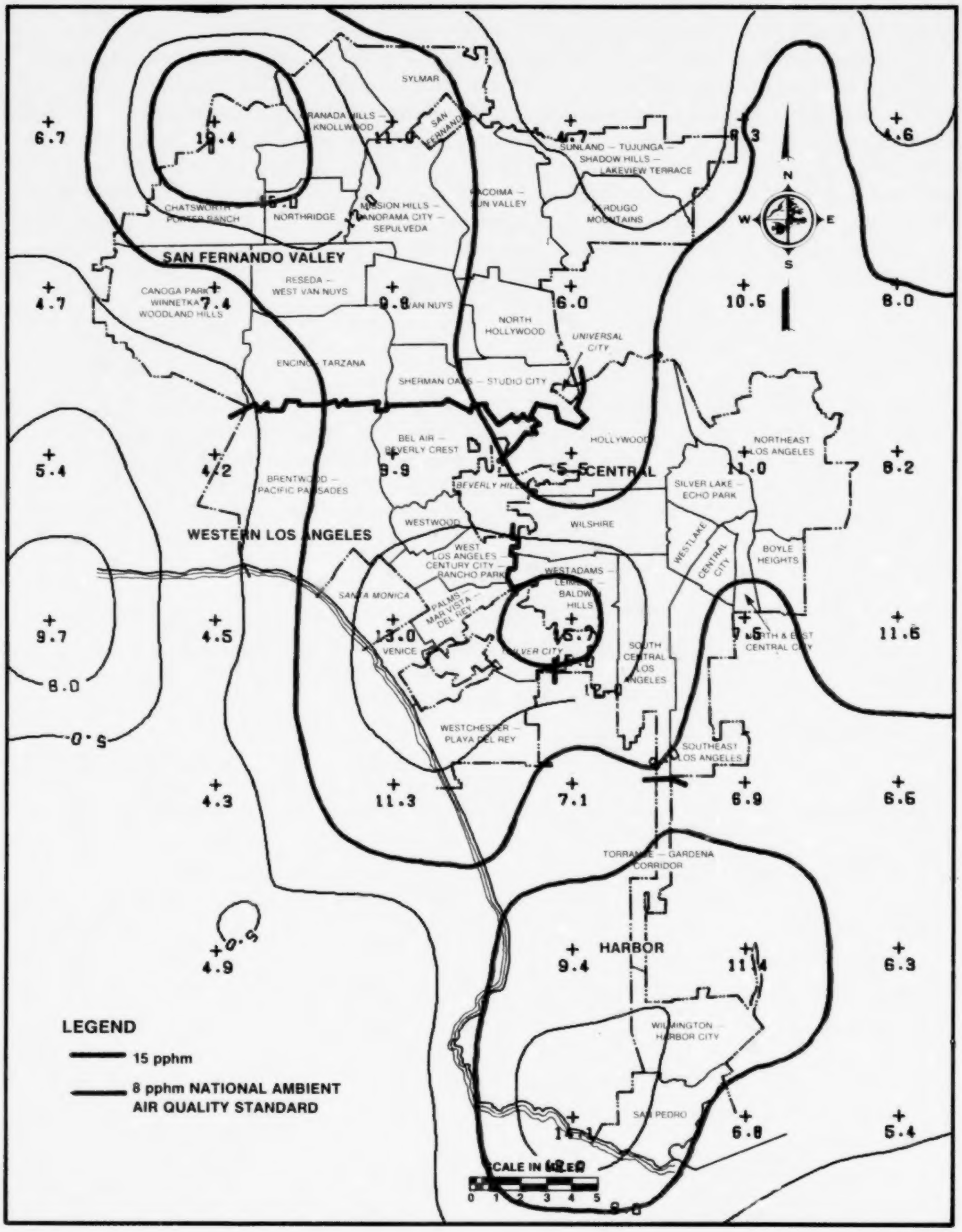
controls being applied proportionately to stationary sources in one sector and mobiles in another or a combination of the two. Changes would occur in the resultant oxidant pattern but such a control scheme should not change the basinwide effect materially. The results are given in Figure X-18. In general, the higher oxidant values were reduced about 3 pphm from the baseline 1990 projections and values below 10 pphm were reduced about 1 pphm. A few values on the periphery of the study area show no change but the reduction of the centrally located peak values to less than twice the air quality standard of 8 pphm is worth noting. The exposure index for this case turned out to be about 72 percent of the baseline or a reduction of some 28 percent.

8. RESULTS AND CONCLUSIONS

A result of the index values for oxidant levels of 8 and 20 pphm is given in Table X-8. The cases have been ordered according to the amount the index value for 8 pphm is reduced from the 1990 baseline. This puts the long-term service area mitigations at the top of the list and the San Fernando Valley mitigations only at the bottom. No attempt has been made here to discriminate between the cases according to complexity, feasibility of implementation or cost.

Table X-8. Regional population exposure levels (RPEL) determined at NAAQS and first-stage episode values for the service area.

AIR QUALITY VALUE	NAAQS (8 PPHM)	EPISODE (20 PPHM)
1990 BASE RPEL (PEOPLE PARTS PER MILLION DAYS)	7.508×10^6	1.613×10^6
SCENARIO	PERCENT REDUCTION FROM BASE	
Long-Term Mitigation	70	68
Regional Core Mitigations	40	40
Basinwide RHC Reduction	28	44
No Service Area Growth	27	49
Fuel Conversion and Basinwide Measures	21	38
Central City Only	20	38
San Fernando Valley Only	15	9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15 pphm
8 pphm NATIONAL AMBIENT AIR QUALITY STANDARD

198P-407

Figure X-18. 1990 oxidant levels for a further 30 percent reduction in all hydrocarbon emissions. No change in NO_x baseline for 1990.

The advantage shown by No Service Area Growth over both Regional Core mitigations and Basinwide RHC reductions for the 20 pphm episode value is interesting. This indicates a decided tendency for basinwide emissions reduction strategy to remove the peak exposures and not materially affect the number of days or exposures over the basic air quality standard. It is entirely possible because of this "clipping" tendency of broad control programs to choose an emissions control strategy that would reduce extreme oxidant conditions yet fail to reduce exposures to concentrations over 8 pphm. Of the seven cases examined here, four show a tendency to do this, although only the Basinwide RHC Reduction and the No Service Area Growth show it very strongly. Both of these cases involve strategy of an across-the-board approach; a 30 percent reduction in reactive hydrocarbon emissions in the whole South Coast Basin and no growth in the service area.

The relative strength of the Regional Core mitigations in reducing both the average and the extreme exposure to oxidant levels strongly suggests that implementable growth strategies can result in significant improvements in air quality for a great number of City residents. The model predictions indicate that a major reduction of oxidant levels could be effectively accomplished by focusing the suggested mitigation measures in that area of the City referred to as the Regional Core.

The approaching of long-term air quality goals can only be accomplished through a combination of altering the present growth patterns through comprehensive land use and transportation planning at a regional level. The future Los Angeles growth and resulting community quality will be strongly dependent, as it has in the past, upon the personal desires and needs of the residents of the City of Los Angeles, as well as the residents of the South Coast Air Basin.

D. summary and conclusions of air quality mitigation

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D. SUMMARY AND CONCLUSIONS OF AIR QUALITY MITIGATIONS

The Hyperion Service Area growth as estimated in SCAG-76 and planned in the Facilities Plan will have a significant (12 to 14 percent increased emissions in the service area versus the no-growth scenario) impact upon 1990 air quality. The introduction of technological modifications and regulations will substantially improve air quality from the 1974 levels. Over the period the results of mobile source emission controls will become apparent and stationary sources will take on increasing importance and require controls to reduce emissions and improve air quality.

The Hyperion Service District will contribute 40 tpd of RHC and 38 tpd of NO_x. The 1974 emission level is 6.76 times the NAAQS of 8 pphm of RHC. The 1990 no-growth scenario would have RHC emissions 3.45 times the NAAQS.

Should mitigative measures be applied to emissions of RHC over the no-growth level, which represents the maximum that could possibly be attributed to implementation of the Los Angeles City Wastewater Facilities Plan, the adoption of two measures, the mandatory use of water-base and high-solids paints, and the restriction of organic solvents and surface cleaning, would result in a reduction of projected emissions associated with the accommodated growth. These two stationary sources could reduce RHC emissions by an estimated 44 tpd, a 110 percent reduction in the 40 tpd emissions that could be attributed to growth.

Implementation of stringent controls on petroleum refining and marketing would result in an additional 2 to 7 tons per day of RHC emissions reductions. The relationship of RHC to NO_x would result in approximately the same effects on NO_x.

Extensive air quality analysis demonstrates that little if any air quality improvement would be discernible should controls be only applied to the San Fernando Valley (as through Alternative CX). Identifiable air quality improvement could be achieved through concentration on localized transit within the regional core. The relative degree of improvement in this geographical location would be emphasized by the concentration of residents within the area. The greatest good for the greatest number could be achieved through the application of controls and transit funds within the Los Angeles City regional core. These benefits could only be achieved if concurrent efforts were made to prevent extensive sprawl development with central city degradation prior to establishment of the improved urban core environment.

The goal of NAAQS within the Los Angeles Basin would not be achieved on a typical smoggy day even if service area stationary source emissions

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were reduced by 40 percent, freeway miles were reduced by 20 percent, and every automobile in the South Coast Air Basin were twice as good, from an emission perspective, as the 1977 Volvo (with three-way converter). Given such a set of mitigations over 50 percent of the City of Los Angeles would still be in excess of NAAQS requirements of 8 pphm.

This study, designed to produce mitigation measures for potential secondary impacts, has identified the following key elements for decision-makers:

- Stationary source emissions controls could mitigate emissions associated with growth that could be possibly attributed to Facilities Plan implementation over the planning period.
- Investments in new automobiles meeting California Air Quality Standards and in technological innovations designed to reduce emissions have been and are expected to continue to improve basinwide air quality during the planning period.
- Urban core transit combined with growth management and stationary source controls could substantially benefit the residents of the City urban core through improved air quality. Benefits to nonurban core residents would be negligible and overall investment costs would be high.
- National Ambient Air Quality Standards will not be met in the Los Angeles Basin within the planning period.
- Further approaching of the NAAQS RHC goals of 8 pphm will necessitate massive private and public investment on a regional scale.

E. mitigation of other secondary impacts

E. MITIGATION OF OTHER SECONDARY IMPACTS

1. ECONOMIC STIMULATION

Economic stimulation associated with implementation of the Facilities Plan should have a positive effect upon employment of construction workers. The location of all facilities within a major metropolitan area should result in no substantial need for nonlocal employment. The potential for reduction of the unemployment level would represent an estimated 5 percent of the total area unemployed. There is no reason to believe that such secondary impacts are of a magnitude that warrant mitigation.

2. CULTURAL RESOURCES

Potential impacts upon historical and archaeological resources can best be mitigated through the identification of such resources in advance. The incorporation of citywide surveys by qualified archaeologists into the overall City Plan including subdivision and new developments would serve to identify areas of potential importance.

Specific potential impacts to paleontological and/or cultural resources through Facilities Plan implementation should include a thorough survey of alternative AVORS tunnel routes prior to final route determination and design. This will ensure that should Alternative C3 be chosen, minimum impacts will be imposed upon cultural resources.

3. GEOLOGY AND HYDROLOGY

Flooding, erosion, and seismic activity are not anticipated to have significant secondary impacts that result from Facilities Plan implementation.

Proper construction practices including no intensive development of hillside areas to ensure slope stability, erosion control criteria incorporated into development plans, adequate flood control, and measures to prevent construction on or immediately adjacent to potentially seismic active faults will protect present and future City residents.

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4. BIOLOGICAL RESOURCES

Remaining native terrestrial biological resources within the City can be protected from secondary impacts through hillside ordinances discouraging excessive clearing and through open space areas such as Griffith Park. Agricultural holding areas zoned for industrial use in the West Valley are expected to be converted to the zoned use should market conditions dictate and adequate wastewater treatment be available. The potential for secondary impacts of poor air quality upon vegetation should be declining with improvements in mobile emissions, and, to the degree that a mitigation strategy can be developed to reduce the emission levels below the no-growth level, further improvements should be seen.

F. preparation of a specific mitigation program

F. PREPARATION OF A SPECIFIC MITIGATION PROGRAM

The City must describe its program to implement secondary impact mitigation measures outlined in this Draft EIS. Because the combined effects of individual mitigation measures may differ substantially from their individual effects, it is important that any mitigations implementation program reflect careful coordination of program subelements.

The program description should include the following information:

- There should be an action timetable which lists specific schedules of implementation for all described mitigation measures. For activities currently underway, there should be documentation that appropriate progress is being made according to existing schedules.
- A description of the sources and availability of funding to carry out the implementation plans is needed, including any possible constraints. This should include discussions of funding for specific elements of the program including, where applicable, comparisons of past and future levels of funding for each jurisdiction, and breakdowns of funding into local, state, and federal monies.
- There should be clear statements and assurances that programs are in effect and are being implemented.

In addition, it is recommended that a program to evaluate the feasibility or effectiveness of additional mitigation measures be undertaken by the City.

Finally, there should be a discussion detailing the manner in which the actions of the contract cities are to be coordinated with the City of Los Angeles.

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G. references

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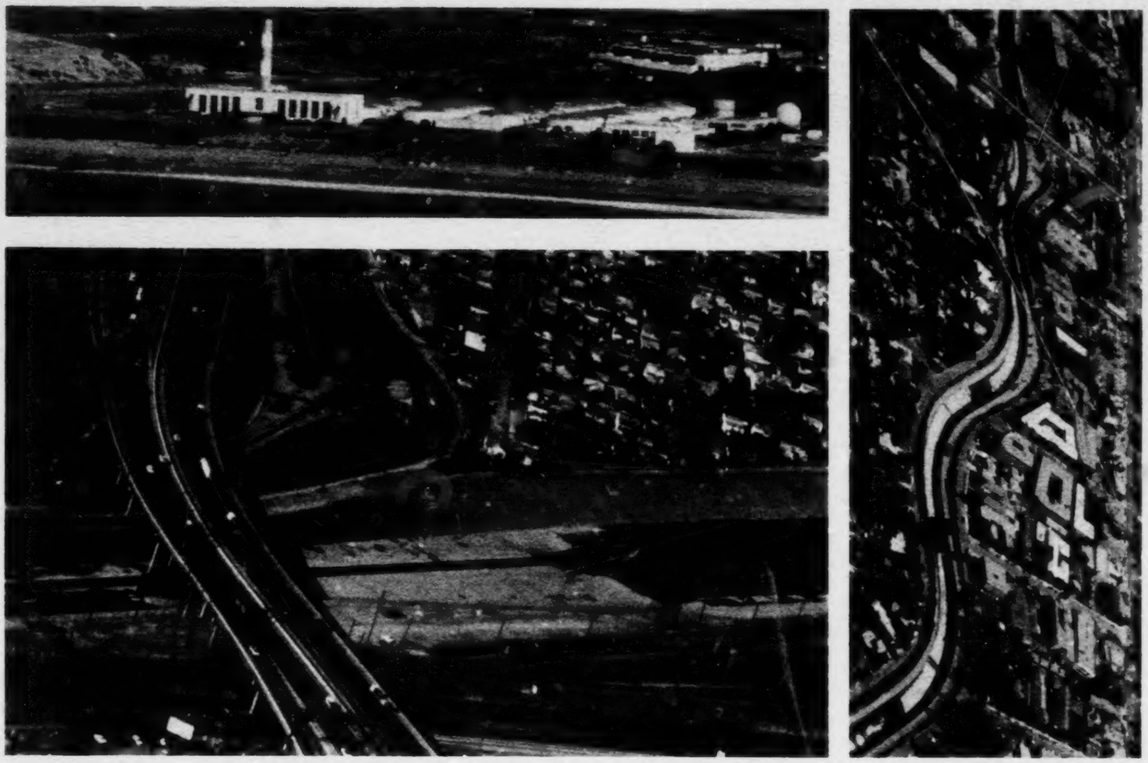

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Chapter XI

the city of Los Angeles' selection of a preferred alternative

Federal, state, and local mandates require that the wastewater facilities of the City of Los Angeles include four key design elements. These are:

- cessation of sludge disposal to the ocean
- full secondary or better treatment for wastes discharged to receiving waters
- capacity adequate to provide for reasonable anticipated growth
- relief from sewage overflows

The first two design criteria are clear federal and state directives. The third criterion is specified at federal, state, and local levels, but its interpretation is subject to various opinions, including the restrictions on population growth estimates that are imposed in air quality maintenance areas. The City has adopted the SCAG-76 population projections, even though these project a larger service area population than the unmodified DOF-EO projections prepared by the state and authorized for use in air quality maintanance areas. The final criterion is City policy and federal and state law and amounts to providing an adequate wastewater collection system within the service area.

All of the wastewater facilities alternatives passing the City's initial screening process meet all four of the key design criteria addressed, and are based on the SCAG-76 population projections. The City's initial screening of alternatives is detailed in Chapter VIII of the Facilities Plan and is reviewed in Chapter VII of this EIS.

All of the alternatives selected by the City for final review and comparison propose additional wastewater treatment at inland sites with a maximum capacity at HTP of 307 mgd. The alternatives receiving final comparison were B3, B4A, B4B, B4C, and E2. (See Chapter VII for explanations of numbering and details.) Alternatives B4C and E2 are as described in detail in Chapters VII, VIII, and IX. Alternatives B4A and B4B differ from B4C only in scheduling for construction of additional modules to Sepulveda and LAGWRP. In all B4 alternatives the final capacity at Sepulveda is 85 mgd and at LAGWRP is 30 mgd. Alternative B3 differs from the B4 alternatives by proposing a final capacity of 95 mgd at Sepulveda and no addition to the existing 20 mgd LAGWRP. In order to supply 95 mgd of wastewater to Sepulveda, a diversion force main and pumping plant would be required in addition to EVIS which is common to all alternatives receiving final City review.

In summary, the only project elements which differ among alternatives receiving final City review are:

- The La Cienega plant which would be constructed only for E2.
- The 10 mgd addition to the LAGWRP which would be built for all except B3.
- The diversion force main and pumping plant which is needed only for B3.
- The construction dates for additions to the SF, and final capacity of 85 mgd for all but B3, which would have 95 mgd at SF.

Chapter VII includes descriptions of all common project elements, and all of the above elements except for the diversion force main and pumping plant. This plant would be located about 2.5 miles southeast of the SF and would have a total direct capital cost of $908,000, with annual operating costs of $24,000. Table XI-1 summarizes project elements and costs for all alternatives receiving final City review.

Table XI-1. Summary description and costs of alternatives receiving final review by the City of Los Angeles.

ALTERNATIVE		HTP SEC. CONV. AND SLUDGE PROCESSING	SEPULVEDA WATER RECLAMATION PLANT	EVIS, UNITS I AND II	SEPULVEDA DAM DELIVERY SYSTEM	GRIFFITH PARK DELIVERY SYSTEM
B4C	Capacity	307 mgd	40 mgd	144 cfs	9 mgd	9 mgd
	Cost[1]	$185,289,000	$38,356,000	$12,335,000	$758,000	$819,000
	Year	1977-1981	1977	1978-1983	1980	1977-1978
B4A	Capacity	X[2]	X	X	X	X
	Cost[1]	X	X	X	X	X
	Year	X	X	X	X	X
B4B	Capacity	X	X	X	X	X
	Cost[1]	X	X	X	X	X
	Year	X	X	X	X	X
B4C	Capacity	X	X	X	X	X
	Cost[1]	X	X	X	X	X
	Year	X	X	X	X	X
E2	Capacity	X	X	X	X	X
	Cost[1]	$195,689,000	X	X	X	X
	Year	X	X	X	X	X

ALTERNATIVE		1ST SEPULVEDA WATER RECLAMATION PLANT ADDITION	2ND SEPULVEDA WATER RECLAMATION PLANT ADDITION	LOS ANGELES-GLENDALE PLANT ADDITION	DIVERSION FORCE MAIN	TOTAL COST[3] PER MILLION GALLONS TREATED
B3	Capacity	40 mgd	15 mgd	None	11 cfs	$245
	Cost[1]	$ 27,304,000	$11,569,000		$908,000	
	Year	1980	1992		1980	
B4A	Capacity	X	5 mgd	10 mgd	None	$243
	Cost[1]	X	$ 4,131,000	$ 5,937,000		
	Year	X	1993	1995		
B4B	Capacity	X	X	X	None	$243
	Cost[1]	X	X	X		
	Year	X	1998	1993		
B4C	Capacity	30 mgd	15 mgd	X	None	$242
	Cost[1]	$ 21,503,000	$11,569,000	X		
	Year	X	1993	1988		
E2	Capacity	X	X	X	None	$246
	Cost[1]	X	X	X		
	Year	X	X	X		

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[1] These costs are estimated capital costs.

[2] X denotes data identical to above.

[3] From Tables IX-15, 23, 24, 25, 26, and 30 of the Facilities Plan.

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Chapter XII

other environmental considerations

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XII-1. Summary rating of unavoidable adverse impacts. XII-4

A. probable significant adverse impacts which cannot be avoided

A. PROBABLE SIGNIFICANT ADVERSE IMPACTS WHICH CANNOT BE AVOIDED

1. PRIMARY IMPACTS

Adverse primary project impacts of all alternatives consist of minor, localized disruptions due to construction activities. These impacts are on soils, noise, air quality, terrestrial habitat, existing land uses, traffic, and use of energy. In general, the more construction sites are included in an alternative, the greater these adverse impacts. The No Project Alternative (A1) includes only minor construction at HTP, and therefore would have the least construction impact. Alternative E2 would have the greatest adverse construction-related primary impact followed by B4C, while C3 and CX impacts would be more similar to A1.

Impacts on water quality and aquatic organisms are primary project impacts and are adverse if A1 is adopted and present discharges continue or expand. Construction phase adverse impacts on water quality will result during the period when HTP is being remodeled (B4C, C3, CX, E2). If hydraulic relief is not provided for the San Fernando Valley, the continued use of septic tanks presents the potential for groundwater contamination (A1, CX). To a limited extent, treatment at Sepulveda with discharge to the LA River presents a potential for groundwater contamination with bacteria and/or viruses. Restrictions on sewer hookups would result from A1 and CX but no direct constraints on other utilities would result from any alternatives. Table XII-1 ranks the alternatives with regard to adverse impacts.

2. SECONDARY IMPACTS

Adverse secondary impacts associated with permitted growth can be mitigated. Such impacts related to whether or not anticipated growth in the San Fernando Valley is curtailed due to restrictions on sewer service are not significant. Alternatives A1 and CX have adverse impacts on economic environmental factors, including employment and availability of housing because of growth restrictions. These same restrictions would benefit natural biological habitats, existing land uses, air quality, and existing community services and utilities. Therefore, alternatives permitting growth can be viewed as having adverse impacts on the many factors that are usually disturbed or stressed during the process of urbanization. This dichotomy between growth and no growth alternatives is apparent in the rankings shown on Table XII-1.

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Table XII-1. Summary rating of unavoidable adverse impacts (least adverse impact is rated 1, most adverse is 5).

IMPACT	ALTERNATIVE				
	A1	B4C	C3	CX	E2
Primary:					
Minor soil disturbance during construction.	1	3	4	3	5
Degradation of water quality during construction.	2	5	5	5	5
Potential for contamination of groundwater.	5	3	1	5	3
Degradation of air quality due to construction and operation activities.	1	4	3	2	5
Noise generation during construction and operation.	1	4	3	2	5
Interference with existing terrestrial habitat.	1	4	4	2	5
Adverse impacts on aquatic resources.	5	1	1	3	1
Interruption or restriction of sewer service.	5	1	1	5	1
Disruption of existing land uses and aesthetics.	1	4	3	2	5
Consumption of energy resources.	1	4	3	3	5
Interference with traffic during construction.	1	3	4	2	4
Secondary:					
Increased flood hazard due to increased urbanization.	1	5	5	1	5
Degradation of air quality due to population growth and vehicular travel.	1	2	2	2	2
Loss of terrestrial habitat due to growth.	1	2	2	2	2
Changes in existing land use due to growth (not necessarily adverse).	1	2	2	2	2
Restrictions to distribution of population.	5	1	1	4	1
Adverse impacts on employment and economy due to growth restrictions.	5	1	1	3	1
Potential for stressing existing community service, utilities, and transportation systems due to growth.	1	2	2	2	2
Potential for disturbing archaeological, paleontological or biological sites of significance due to future growth.	1	3	3	1	3

Note: Alternatives are compared only for each individual impact. No implications are intended regarding relative importance of impacts listed.

Beneficial project impacts are not discussed in this chapter and are not listed on Table XII-1. Projects with the greatest number of adverse impacts may also have the greatest benefits. Chapters VIII and IX should be consulted for full impact discussions.

B. irreversible or irretrievable environmental changes or commitments of resources

B. IRREVERSIBLE OR IRRETRIEVABLE ENVIRONMENTAL CHANGES OR COMMITMENTS OF RESOURCES

Construction of additional sewage treatment capacity will utilize power and materials which are essentially irretrievable. Since construction materials would have a very small salvage value and future utility, their use should be considered as a long-term commitment of resources.

Energy use is an irreversible commitment of fuel resources. More energy will be used during plant operations than can be generated by combustion of methane produced in the sewage treatment process. Much of the increased energy use will be for advanced treatment of wastewater and for sludge disposal. The loss of freshwater in sewage discharges to the ocean is also an irreversible commitment of resources. Providing reclaimed water for industrial or irrigation purposes avoids this irreversible commitment of freshwater resources which would otherwise be discharged to the ocean. Alternatives providing the most reclaimed water (E2, then B4C) will have the highest commitment for direct energy use but the greatest potential for water reuse. The savings in water import requirements, in turn, could result in energy savings.

The disposal of sewage sludge to landfills (B4C, C3, CX and E2) is probably an irretrievable commitment of the resource, although future methods of trapping gasses generated or excavating the material could lead to its reuse as fuel or soil conditioner. Landfilled sites can be used for other purposes after the landfill is closed.

Land use changes required for new construction are not strictly irreversible, but returning a sewage treatment plant site to farmland (at SF, for instance) would require extensive effort and probably would not be economically feasible. Urbanization resulting from anticipated growth permitted as a result of providing adequate service will also result in irretrievable commitments of energy and long-term commitments of land and materials.

The only irreversible changes in the marine environment that are anticipated from implementation of the Facilities Plan relate to the discharge of toxic chemicals. The physical and chemical alterations of the benthic sediments along with bacterial and viral contamination of the area near the outfalls are all considered short-term effects since these conditions could be reversed. The increase in environmental background levels of nondegradable or slowly degradable toxic substances resulting from wastewater discharge, however, should be considered irreversible, even though the increase may not be measurable with the present analytical techniques.

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The potential irretrievable commitments of marine resources should be reduced somewhat by all but the No Project Alternative. These commitments primarily involve potential losses in fish and other wildlife, such as brown pelicans or marine mammals, that may result from the bioaccumulation of toxic substances. These are not direct lethal effects, but rather indirect or sublethal effects. For example, the level of toxic substances (e.g., DDT or mercury) bioaccumulated by fish may exceed the FDA level in fish for sale for human consumption and thus decrease the useful productivity of the fishery. In addition, the accumulation of DDT or its metabolites in birds may lower their reproductive success by decreasing hatchability of the eggs. The influence of discharges from HTP on these resources, however, cannot be distinguished from the effects of other discharges into the Southern California Bight.

C. relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity

C. RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The continued urbanization of the San Fernando Valley, which will not be restricted by implementation of Alternatives B4C, C3 or E2, will result in some loss of productivity of terrestrial biological resources. This impact will also result from use of land for the treatment facilities. The use of reclaimed water for irrigation of parks and recreation areas will increase productivity of these areas, but the value as wildlife habitat will be small because of intensive human use. No replacement of lost agricultural areas is expected.

The alternatives for wastewater treatment presented in this EIS (excluding No Project) should decrease the potential adverse effects of wastewater discharge to the ocean on long-term productivity. Sewage disposal in the ocean may be considered a short-term local use of the environment since total reclamation of the effluent is technically feasible and could occur in the future. The potential impacts of sewage discharge on the long-term productivity of the ocean result from the release of nutrient and toxic substances. Discharged nutrients may increase productivity on a short-term basis as well as add to the general nutrient pool in a marine ecosystem. The long-term effects of discharged toxicants (e.g., mercury, chromium, and chlorinated hydrocarbons) occur primarily through bioaccumulation. Thus, although direct mortality may not occur, fish stocks may be unusable as a human food source since their flesh does not meet the FDA standards for toxic substances such as DDT or mercury. Productivity of birds or marine mammals may also be decreased by toxicants via bioaccumulation and reduced reproductive success.

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